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INTERIOR OF THE SHOEING SHOP.
Mounted Service School.

# MANUAL FOR ARMY HORSESHOERS

▽

1917

PREPARED FOR THE USE OF STUDENTS OF
THE MOUNTED SERVICE SCHOOL
FORT RILEY, KANS.

WASHINGTON
GOVERNMENT PRINTING OFFICE
1917

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WAR DEPARTMENT,
WASHINGTON, *October 26, 1917.*

The Manual for Army Horseshoers, 1917, prepared at the Mounted Service School, Fort Riley, Kans., for the use of students of the Department of Hippology, as well as for the Army at large and the National Guard, is published for the information and guidance of all concerned.

[461.1, A. G. O.]

BY ORDER OF THE SECRETARY OF WAR:

TASKER H. BLISS,
*General, Chief of Staff.*

OFFICIAL:
H. P. McCAIN,
*The Adjutant General.*

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# MANUAL FOR ARMY HORSESHOERS.

## CHAPTER I.

### HORSESHOERS' TOOLS AND THEIR USES—THE FORGE.

(Plate I.)

**1.** The *clinch cutter* (fig. 1) consists of two parts—the blade and the point. The blade is used to cut or to raise the clinches, being placed under the edge of the clinch and struck with the driving hammer. The point is used to punch nails and stubs out of the hoof. It is often placed in the crease of the shoe, under the head of the nail to be withdrawn, and struck smartly with the hammer. The blow raises the nail sufficiently to enable the pinchers to grasp the nail head.

The *pinchers* (fig. 2) are used to remove shoes and to draw nail stubs and improperly driven nails.

The *driving hammer* (shoeing hammer) (fig. 9) should be used only to drive horseshoe nails, to wring off nails after they have been properly driven, and to make clinches.

The *nippers* (fig. 4) are used to remove the surplus growth of wall.

The *shoeing knife* (fig. 3) is used to pare away the dead horn near the white line; to make a seat for clips; to remove loose particles from the hoof; to relieve pressure on corns and cracks; and to open the sole and wall for the escape of pus or for the removal of foreign bodies.

The *horseshoers' rasp* (fig. 5) is used to prepare a level-bearing surface of the foot; to remove extra length of toe; to smooth the edges of the wall; to even clinches; to make a slight groove under each clinch; and to run lightly over the clinches in order to smooth them. The rasp that is used on the hoof should never be used at the bench; use an old rasp for working on metal.

The *rounding hammer* (fig. 10) and *fitting hammer* (fig. 11) are used in fitting and in turning shoes.

The *hoof tester* (fig. 7) is used to locate injuries or soreness of the sole. Place one point on the sole and the other on the wall; press by closing the handles; shift the points and continue until the horse flinches. The pinchers may be used for the same purpose, but are not as satisfactory.

The *clinching tongs* (fig. 6) are used to bend the clinches downward.

The *clinching block* (fig. 15) is used in turning the clinches.

The *tongs* (fig. 8) are used in handling hot metals.

The *pritchel* (fig. 16) is made by hand from round or octagonal steel, and is used for opening the nail holes in horseshoes. The point is drawn the same size and shape as the shank of a nail halfway between head and point, so that the hole punched in the shoe will fit the nail snugly and not allow any motion. Examine the nail carefully and learn the exact size for the pritchel. To draw out the point of the pritchel, heat it to a cherry red and, placing the pointed end flat on the face of the anvil near the far edge, strike with the hammer held at an angle to properly change the upper face, turning it as necessary so that the finished point will be of the shape desired. Never heat the pritchel beyond a cherry red; cool it gradually by placing it in the coal at the edge of the forge and never in the water. The face of the horseshoers' anvil should have a round edge near the base of the horn on the far side. This edge is used for sharpening tools.

*Hardies*, the straight (fig. 12) and the half-round (fig. 13), are used to cut hot metals. Their principal use for horseshoers is in cutting off the heels of shoes, and for this purpose a sharp cutting edge is required. When the hardy becomes dull the edge is drawn out on the face of the anvil in the same manner as the pritchel. A sharp edge is then put on by hot rasping, using the smooth side of the rasp. After sparpening, the *cutting edge* should be tempered as follows: Heat the blade of the hardy slowly to a cherry red; hold the cutting edge under water so that about one-half inch of the blade is immersed, and, when there is no longer

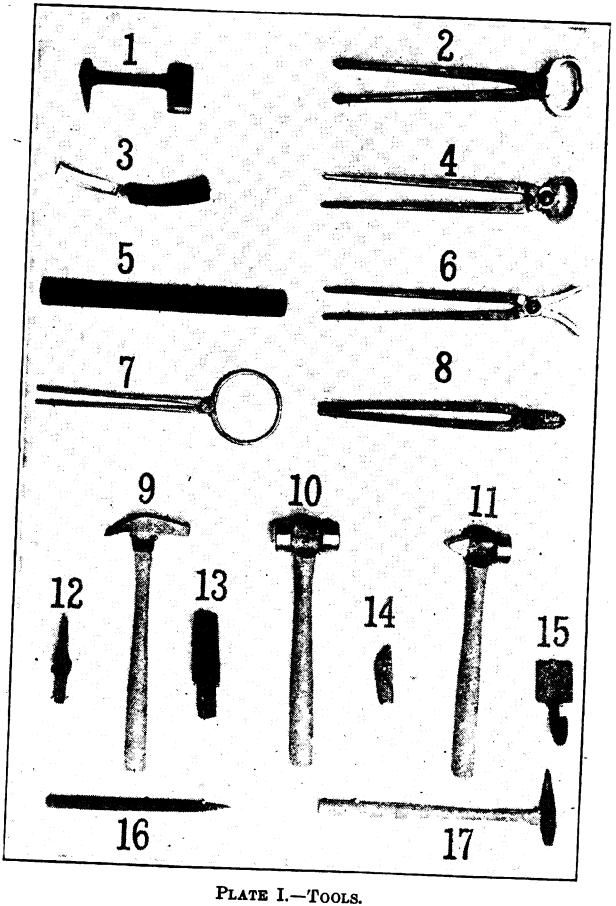


PLATE I.—TOOLS.

any sizzling, plunge the whole hardy under water and remove it at once; rub the blade on the floor to remove loose flakes of metal and to give it a slight polish; now carefully observe the change in color as the remaining heat in the body extens badck to the edge; the color will be first straw, then copper, and finally blue; as soon as the blue color has reached the cutting edge, place the whole hardy under water and leave it there until thoroughly cooled.

The *creaser* (fig. 14) is used to crease the shoes and to repair damaged creases.

The *countersink* (fig. 17) is used in hand-made shoes to punch holes of sufficient size to receive the heads of the nails; these holes are completed by the use of the pritchel (fig. 16).

*Horseshoe nails* retain the shoe on the foot. These nails (furnished in several sizes) are machine-made and pointed; they are slightly concave on one side and flat on the other; there is a short bevel at the point on the concave side. In driving the nail into the hoof the *flat side is held faced outward.*

**2. The anvil.**—The working parts of the anvil (Pl. II, fig. 1) are the *horn*, the *face*, and the *heel*.

The face, or the upper plane surface, is of steel, and is welded to the iron body. The anvil is firmly fastened to a wooden block, which is sunk into the ground to a depth that will bring the surface of the face at a convenient working height above the ground—from 30 to 36 inches.

The horn is used to open and to shape shoes; the face to level the web and for welding; and the heel to straighten heels of shoes and to turn calks. Clips are ordinarily drawn on the edge of the face, but in the anvil shown there is an attachment near the base of the horn which is used for this purpose. The square hole in the face (hardy hole) is a socket for hardies; the round hole (pritchel hole) permits the passage of the pritchel through the nail hole of the shoe.

The flat surface at the base of the horn is relatively soft iron and is used to rest hot metals on when cutting them with a chisel.

The anvil weighs from 125 to 150 pounds.

Figure 2 shows the tool box issued by the Quartermaster Corps. Its use is readily understood, and the only instruction required is that all tools should be placed in the box, handles out. An objection to this box is that it is easily tipped over. On this account many shoers prefer the pattern shown in figure 3, although the tools are not as near to the hand.

**3.** Plate III shows a section of a portable forge. In every forge air is forced through the fire by a bellows or a fan (F); the latter is

made to revolve by a drive wheel or by a handle (H). The twyer ball (T) corresponds to the grate of a stove. Firmly attached to it and extending toward the worker is an iron rod by which the ball

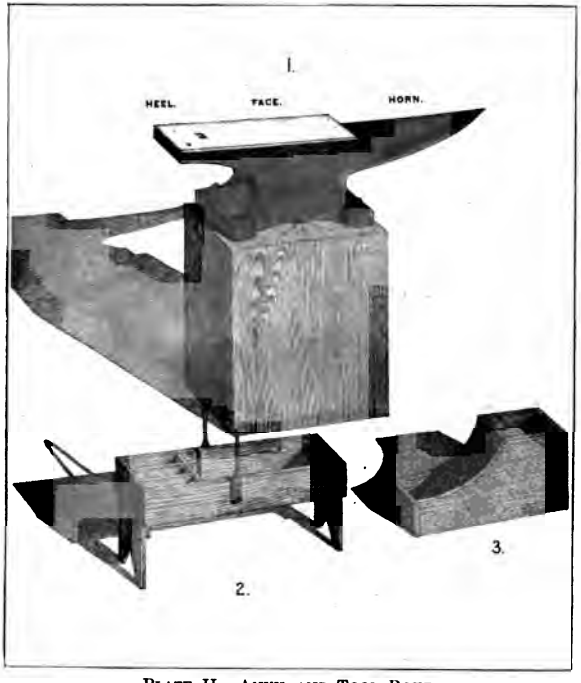


PLATE II.—ANVIL AND TOOL BOXES.

may be rocked. The end of this rod is shown by the small circle in the center of the twyer ball. A crater (C) should be made around the twyer ball in order to confine the fire. Clay may be used for this purpose, but cement is better.

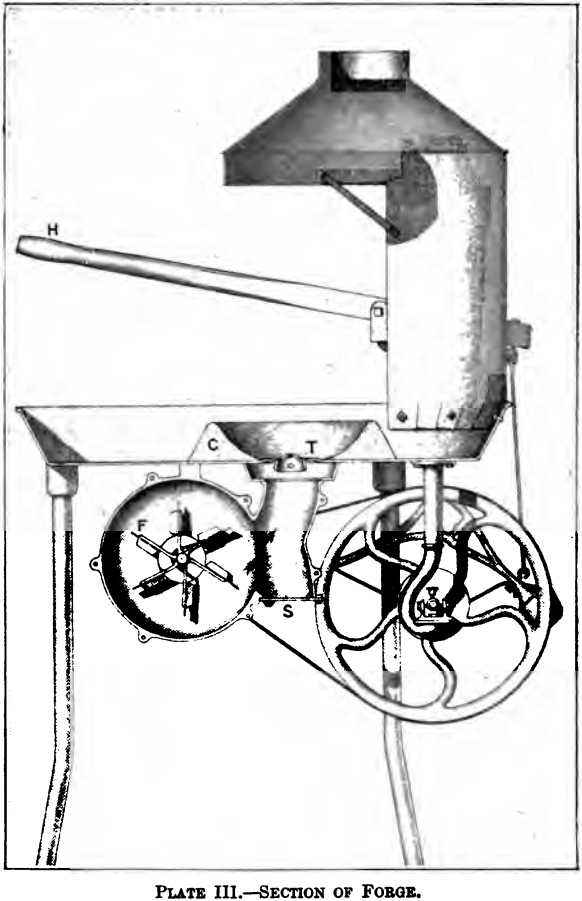


PLATE III.—SECTION OF FORGE.

4. The field outfit issued by the Ordnance Department is designed especially for portability, and is packed in two chests. Chest No. 1 (22 by 18 by 13 inches) contains a small knock-down forge with fan and drivewheel and a complete set of forge and shoeing tools. Weight of chest, packed, 122 pounds.

The Schaller forge and equipment.

Chest No. 2 (21 by 17 by 10 inches) contains a small anvil and block, water bucket, leather shoeing box, and apron. Weight of chest, packed, 68 pounds.

The field anvil weighs 17 pounds.

The Schaller forge and equipment is lighter and more compact than the old field outfit and is gradually replacing it.

## CHAPTER II.

## THE FIRE—HEATS.

### THE FIRE.

**5.** Coal, charcoal, coke, or even wood, may be used as fue
create the necessary heat in the forge.

Before building the fire the crater of the forge must be t
oughly cleaned, removing all dirt, ashes, and unconsumed f
The twyer ball should be rocked vigorously, and the slide
opened. A few blasts will aid in removing the accumulated d
The ball is often so heated as to fuse, and melted metal and cli
ers may close the openings around the ball, preventing the pas
of the blast. The obstructions must be removed by the us
the poker.

Coal is banked around the twyer ball in the form of a cra
in the center of which dry particles of any inflammable mate
are placed and ignited. When these particles are burning, c
or wet coal (if no coke is available) is gradually placed on the
and the fan is revolved slowly, care being taken not to cover
closely that the flames are smothered.

When the fire is burning brightly, it should be built up arou
the edges with wet coal, which will in time become coke. (
Heats.) This coke is next burned and is replaced by wet co
thus keeping up the supply of coke. Green coal is of little use
heating iron or steel for the reason that it does not give a hi
degree of heat, that it sticks to the metal, and that it emits a smo
which interferes with the work.

A clear fire without smoke is essential for good work, and t
higher degrees of heat can only be obtained from such a fire.

The depth of the fire should be about 9 inches; the metal is th
supported at the place of greatest heat, about 6 inches above t
twyer ball.

If the metal is too near the twyer ball the heat is affected by the cold blast.

To bank a fire, cover thoroughly with the fuel and *open the slide low;* this will keep the fire alive for several hours. Whenever the fire is left for more than a few minutes the slide should be left open.

CLINKERS.

**6.** Heated steel or iron gives off particles or scales which remain in the fire. These melting particles bind together particles of burned coal, gradually becoming larger and finally forming what is called a clinker. Clinkers give off but little heat and obstruct and spoil the fire; they must therefore be removed as fast as they form. Their presence will be shown by a tendency of the fire to spread and an unusual throwing out of sparks. If indications of clinkers appear, open up the fire with a poker, and as soon as the air touches the clinker it will turn black and become a solid mass which can be lifted out entire. Trying to drag out the clinker without opening up the fire only results in breaking up the clinker and making the fire worse than it was before.

HEATS.

**7.** There are four degrees of heat that are to be considered by the horseshoer, and they are generally designated as the *black*, the *cherry red*, the *white*, and the *welding* or *sparking heat*.

The *black heat* is when the shoe is hot but shows no color, and is used in making minor changes in shaping, leveling, and in opening nail holes.

The *cherry red heat* is when the steel or iron shows a bright cherry-colored glow. It is used in the general shaping of the shoe, in pointing the pritchel, and in sharpening tools.

The next degree of heat is called the *white heat* because the steel or iron then shows almost that color. This heat is used when it is necessary that the metal should be very pliable and easily worked, as in drawing toe clips, cutting off the heels, in drawing the heels of the shoe, in hot rasping, and in turning heel calks.

The *welding heat* is sometimes called *sparking heat* for the reason that the metal then gives off small particles which explode or spark above the fire. As soon as the sparks appear watch the

metal closely, and when the part to be welded has a bubbling (fluxing) appearance it must be withdrawn from the fire and worked immediately. The success of a weld depends entirely upon the proper heat of the parts at the exact moment the weld is attempted.

A newly made coal fire can be used for ordinary heating, but for a welding heat coke is required. Coke is ordinary coal from which the gases have been driven off by gradual heating. It will be found ready at hand around the edge of the fire. As coke does not smoke, there is no trouble in observing when the metal has reached exact welding heat.

## CHAPTER III.

## WORKING AND SHAPING IRON.

### THE PLATE SHOE.

**8.** As a preliminary to instruction in shaping and preparing a shoe *for the foot*, it is best for beginners to learn the method of making and shaping a plate shoe, using an *old shoe* as a model.

The various parts of a shoe are commonly spoken of as follows: The toe is that portion between the first nail hole on one side and the first nail hole on the other side. The quarters are the portions in which the nail holes are punched. The heels are the remaining parts of the shoe. A side is one-half of a shoe, and includes one heel, one quarter, and one-half of the toe.

The plate shoe is made of $\frac{1}{2}$ by $\frac{1}{4}$ inch steel which is much more easily worked than the heavier service shoe.

Take a bar of metal about 11 or 12 inches in length.[1]

**9. To bend the bar, where the center of the toe will be.**— Place the bar in the fire so that the center is directly over the draft. The coals of a properly-made fire should hold the bar about 6 inches above the twyer ball. When cherry red, remove from the fire, holding the nearest end with the tongs and lean the other end on the edge of the anvil farthest from you. The bar is held on edge and at an angle of about 45° with the face of the anvil. The tongs

[1] The length of bar required to make a shoe *for a foot* will be found by measuring in a straight line on the sole of the foot from the edge of the wall at the center of the toe to the extremity of either bulb of the frog. A little more than twice this distance will be the length of the bar required to make the shoe.

grasp the bar about 2 inches from the end and an equal amount projects over the edge of the anvil, so that the point struck will be midway between the points of support.

Strike lightly with the hammer at the center of the upper edge of of the bar, and gradually bend the bar until it is right angled or L-shaped.

If, after bending, the L is not flat, but twisted, it must be leveled on the face of the anvil.

Remember to use only light blows on red metal. Heavy blows leave irregularities that are difficult or impossible to remove.

**10. To shape one side.**—Place one-half of the L in the fire, and when heated seize the cold half with the tongs and hold the heated side diagonally over the horn of the anvil, the left hand near the

base and held low, the heated end projecting about an inch over the horn.

Begin striking at the end of the heated portion and, keeping the right hand steadily in position, shape the steel by gradually

moving it beneath the hammer. Move the steel over the horn by raising the left hand and carrying it toward the point of the horn; that is, as the toe is approached, shift the work toward the point of

the horn. As the shoe is moved toward the point of the horn the hammer follows the curve on the side of the horn.

The horn of the anvil is so constructed that the diagonal curve across the center conforms to the shape of the heels and quarters of

the average sized foot and the curve near the point is shaped like the toe. For a very large shoe begin near the base of the horn.

To shape the opposite side, proceed in the same manner.

**11. To center the toe.**—After both sides have been turned see if they are of equal length; that is, see if the toe is in the center. If not, then heat the toe, and grasping the longer side with the tongs,

hold the shoe over the point of the horn so that it is correctly centered and strike just beyond the horn.

**12. To draw out the heels.**—Heat the heels to a white heat. Hold the shoe on the horn in the same position as for shaping and

upon a diagonal that will insure close contact. The blows, however, are struck on the part resting on the horn and the heel is brought toward the hammer by lowering the left hand.

In drawing out the heels the lower (or ground) surface of the shoe should be made slightly narrower than the upper (or bearing) surface.

Notice that to draw out one heel the ground surface is on the left side when the heel rests on the horn.

To draw out the other heel the ground surface is on the right side, and the shoe is changed to the opposite diagonal of the horn.

In both cases strike on the edge of the ground surface, and as a result this surface will be the narrower.

For a left-handed man these positions will be reversed.

This drawing out narrows and at the same time thickens the heel. To restore it to its original thickness, work on the face of the anvil. Hold the ground surface down so as to preserve the bevel.

**13. To cut off the heels.**—Apply the shoe to the model and note how much must be cut from the heels. Care must be used,

however, not to cut them too short. It is better to have them too long and to cut them off again if necessary.

After heating to a white heat, place the ground surface on the hardy so as to cut the heel off squarely, but hold the toe slightly lower so that the cut will also be beveled; that is, so that the upper

surface will be slightly longer than the ground surface. The cutting will widen the steel near the end.

To bring it back to the original width hold the inside edge on the heel of the anvil and strike on the outer edge.

This will also point the heel slightly and diminish the work of hot rasping (par. 14).

In fitting a plate shoe for a foot the nail holes should be punched *before* cutting off the heels so that if necessary the toe can be centered to correspond to the nail holes.

**14. Hot rasping.**—The heels are now finished by hot rasping. The shoe is placed in the vise with the ground surface toward you, and the heels are rounded, carefully preserving the slight bevel

(the upper surface being longer and wider than the ground surface).

Care must be used to leave no sharp edges on the heels that will cut the horse.

A pointed heel may cause a "shoe boil" (a bruise at the point of the elbow).

**15. To punch out the nail holes.**—Apply the shoe to the model; if the heels are of proper length and the shoe is an approximate fit, the nail holes are punched out.

Examine the pritchel, and if it is not of the proper shape, point it before using. (*See* Tools, par. 1.)

The nail holes are started on the ground surface with the countersink because the point of this tool conforms to the shape of the head of the nail. The point should not be driven more than three-

fourths through or the shoe will be bulged and ruined. The tool is held slanted outward to conform to the direction which the nail should follow and the hole is started a little outside of the center of the web.

Heat one side and first start the hole nearest the toe. Its proper position can be learned by examining a service shoe of the same size. The hole at the bend of the quarter is next started, and finally the hole midway between the two. The plate shoe, on account of its light weight, requires but six nails, three on each side.

Heat the other side and proceed as before.

The nail holes must not be placed too far back. A shoe nailed back of the turn of the quarter will impede the expansion of the hoof and eventually cause contraction of the heels.

If, in punching the nail holes, bulges appear near them on the edges of the bar or shoe, they must be removed by working over the horn. (Same position and means as for drawing heels.)

Punch out the nail holes on the ground surface, holding the pritchel slanted outward; then punch out the holes on the upper surface, holding the pritchel slanted inward.

In pritcheling out a nail hole, to avoid blunting or breaking the point of the pritchel, that part of the shoe where the nail hole is to be is held over the pritchel or hardy hole.

**16. Fitting.**—The shoe is now ready for its final trial and is applied to the model.

If it does not exactly conform to the model, it will have at least one of the following faults, which must be corrected according to the explanation given in each case.

**17. Not level.**—To level the shoe, take it with the tongs near the toe on the far side and examine it by sighting over the upper surface. If it appears to be crooked, lay it on the face of the anvil in a position allowing the highest surface to be struck (par. 9). If, after

remedying this defect, a similar one appears, it must be treated in the same manner. A crooked shoe will not stay on the foot and is apt to cause lameness.

When leveling the service shoe, if it be found necessary to strike on the ground surface of the shoe, let the blows fall over the crease in order to avoid spoiling the concave of the upper surface. Special

care, however, must be used to strike a square blow. If the face of the hammer does not fall evenly, it will dent and close the crease.

**18. Too wide at the toe.**—Heat the toe and hold it on the extreme point of the horn, the center of the shoe resting on the horn

of the anvil. Strike lightly near the toe on the side farthest from you, then reverse the toe and strike as before.

Whenever the width of the shoe is to be changed, or a heel or a quarter is to be thrown in or out, first make a guide mark on the

anvil. To do this hold one heel against the edge of the anvil toward the horn and draw the shoe across the anvil so that the other heel will make a mark on the face. Repeat this after the change is made and a comparison of the two marks will show the amount of the change.

**19. Too narrow at the toe.**—Heat the toe and hold it on the horn of the anvil so that there will be a small space between the shoe and the horn. Strike lightly along the toe, not confining the blows to any one spot.

**20. One heel and quarter too narrow.**—To throw out a heel and quarter from a given point. Heat the quarter and, holding

the heel on the horn, strike on the spot from which it is desired to spread or throw out the heel and quarter.

**21. One heel and quarter too full.**—(*a*) To throw in a heel and quarter from a given point. Heat the quarter and hold it over the point of the horn of the anvil so that the shoe will rest upon the inside edge *at the point* from which the change is to be made. Strike near the heel on the part projecting over the horn.

(*b*) To throw in one side without changing its general shape. Heat the side that is to be thrown in and close the shoe bodily (par. 24), which operation will affect the hot side only.

(*c*) If neither of these methods accomplishes the desired result, the quarter must be reshaped over the diagonal of the horn.

**22. A bulge in the quarter.**—Heat the quarter and hold over the heel of the anvil. Strike directly over the bulge.

This will remove the bulge, but will also slightly straighten the quarter, which must later be reshaped.

**23. A short straight place in a quarter.**—Heat the quarter and hold the straight place on the point of the horn, as shown in

paragraph 21, but strike alternate blows on each side of and close to the point to be rounded.

**24. Both quarters too full** (with the general shape correct.)—Heat the whole shoe and, holding it on edge on the face of the anvil, strike down on the elevated quarter. This will narrow or close the shoe, but will not change its general shape.

**25. Both quarters too narrow** (with the general shape correct).—Heat the whole shoe and, holding one heel on the face of the anvil and one on the side, strike on the toe. This will open or spread the shoe without changing its general shape.

A perfect fit having been obtained the nail holes are repunched if necessary, and the whole shoe neatly finished with the rasp.

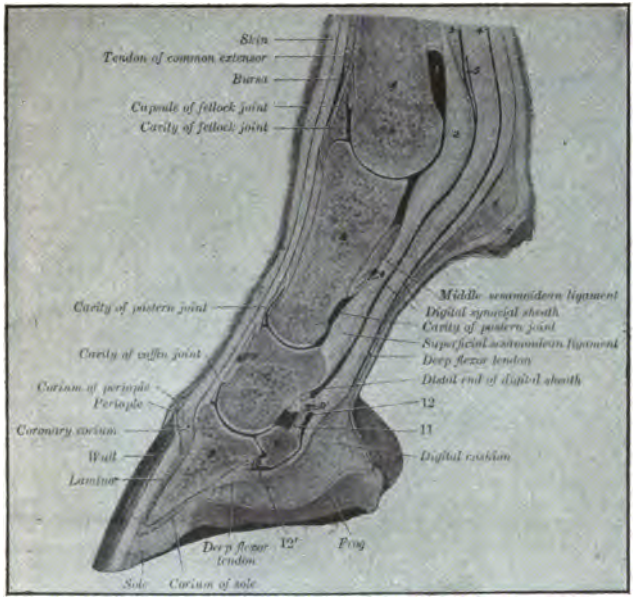


**PLATE IV.—SAGITTAL SECTION OF DIGIT AND DISTAL PART OF METACARPUS OF HORSE.**

*A*, Metacarpal bone; *B*, first phalanx; *C*, second phalanx; *D*, third phalanx; *E*, distal sesamoid bone; 1, volar pouch of capsule of fetlock joint; 2, intersesamoidean ligament; 3, 4, proximal end of digital synovial sheath; 5, ring formed by superficial flexor tendon; 6, fibrous tissue underlying ergot; 7, ergot; 8, 9, 9', branches of digital vessels; 10, distal ligament of distal sesamoid bone; 11, suspensory ligament of distal sesamoid bone; 12, 12', proximal and distal ends of bursa podotrochlearis. By an oversight the superficial flexor tendon (behind 4) is not marked.

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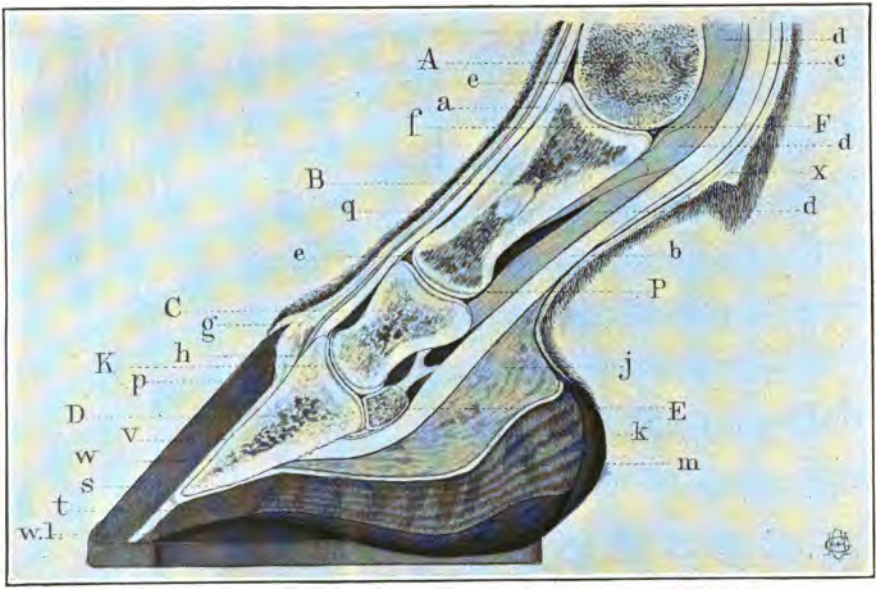


DIGITAL SECTION OF FOOT AND PASTERN.

A, Cannon bone; B, os suffraginis; C, os coronæ; D, os pedis; E, os navicularis; F fetlock joint; K, coffin joint; P, pastern joint; a, extensor pedis tendon; b, flexor pedis perforans tendon; c, flexor pedis perforatus tendon; d, sesamoidan ligament; e, capsular ligament; f, articular cartilage; g, perioplic ring; h, coronary band; j, plantar cushion; k, sensitive frog; m, horny frog; p, periople; q, skin; s, sensitive sole; t, horny sole; v, sensitive laminæ; w, horny wall; w. l., white line; x, ergot.

## CHAPTER IV.

## ANATOMY AND PHYSIOLOGY OF THE HORSE'S FOOT.

**26.** By *anatomy* of the foot is meant a description of the various parts entering into its formation, and by *physiology* is meant the functions or uses of these parts.

**27.** The horse's foot is composed of four parts—the bones, the elastic structures, the corium, and the outer protective covering of horn, called the hoof, which incloses and protects the other parts.

**28.** The bones of the pastern region and foot form a column extending downward from the fetlock into the hoof. They are the first phalanx (long pastern bone), extending from the fetlock joint to the pastern joint; the second phalanx (short pastern bone), extending from the pastern joint to the coffin, or pedal, joint; the third phalanx (coffin bone) and the *navicular bone* (distal sesamoid). (See Pl. IV.)

The *third phalanx* (coffin bone) is of irregular shape, is situated within the hoof, and is similar to the hoof in form. The surface of the front and sides is known as the *wall surface*. It has a number of small openings for the passage of blood vessels and nerves, and is roughened to give attachment to the *laminar corium* which covers it. At the top of this surface, in front, is a projection called the *extensor process*, to which is attached the common digital extensor tendon (common extensor of the foot). On each side of the coffin bone is an extension to the rear called the wing. The lateral cartilages are attached to the outer and upper borders of the wings and the ends of the navicular bone are attached to the inner surfaces.

The lower surface of the coffin bone, called the *sole surface*, is concave, half-moon shaped, and smooth, except at the back part, which is roughened for the attachment of the tendon of the deep flexor of the foot. It is called the *tendinous surface*. The upper surface, called the *articular surface* or *joint surface*, articulates with the second phalanx and navicular bone, and with them forms the coffin joint.

The navicular bone (distal sesamoid) is an elongated irregular shaped bone, the ends of which are attached to the wings of the third phalanx. The upper and front surface enters into the coffin joint

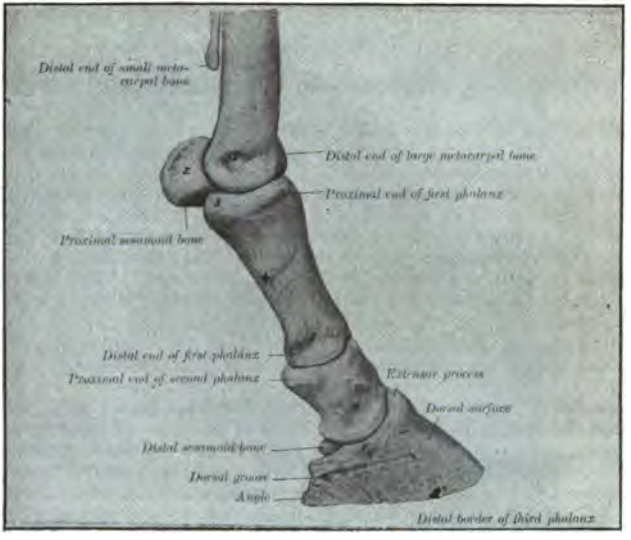


PLATE V.—SKELETON OF DIGIT AND DISTAL PART OF METACARPUS OF HORSE; LATERAL VIEW.

1-7, Eminences and depression for attachment of ligaments. Cartilage of third phalanx is removed.

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and articulates with the second and third phalanges, and the lower surface is covered with articular cartilage to provide a smooth surface for the movement of the tendon of the deep flexor of the foot.

**29.** The *elastic structures* are the *cartilages* of the *third phalanx*, also known as the lateral cartilages and the *digital cushion* (plantar cushion, Pls. IV and VI). All parts of the foot, except the bones, are to a certain extent elastic, but these structures are especially so.

The lateral cartilages are two large elastic plates of cartilage, one attached to the top of each wing of the third phalanx. They extend backward and upward so far that their upper borders may be felt under the skin above the coronet at the heels.

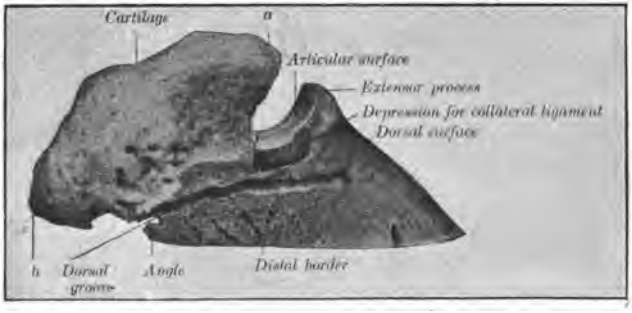


PLATE VI.—THIRD PHALANX OF HORSE; LATERAL VIEW.

*a*, *b*, Anterior and posterior extremities of cartilage.

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The *digital cushion* (plantar cushion) is a very elastic wedge-shaped pad, which fills up the space between the lateral cartilages on the sides, the frog below, and the deep flexor tendon of the foot above. The point, or front part, of the digital cushion extends forward to the ridge which separates the sole surface from the tendinous surface of the third phalanx and lies just below the lower end of the deep flexor tendon. The base, or back part, is covered by the skin above the heels. If the frog comes in contact with the ground when the foot is planted, the digital cushion acts as a buffer and prevents jar. (See Pl. IV.)

**30.** The *horn secreting structures* of the foot cover the bones and elastic structures. This tissue, the *corium* of the hoof, is highly vascular and is a modified form of the true skin, or dermis. It develops the horn, which is a modified form of the epidermis. It is a continuous structure, but for description is divided into the *perioplic corium or ring*, *coronary corium or band* (Pls. VII and VIII), *laminar corium* (sensitive laminæ, Pl. VII), the *corium of the sole*

PLATE VII.—LATERAL VIEW OF FOOT OF HORSE AFTER REMOVAL OF HOOF AND PART OF SKIN.

Dotted lines in front of navicular bone indicate position of coffin joint. (After Schmaltz, Atlas d. Anat. d. Pferdes.)

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(sensitive sole, Pls. IV and VIII), and the *corium of the frog* (sensitive frog, Pl. VIII). All except the sensitive laminæ are covered with fine *villi* which secrete different parts of the hoof.

The *perioplic corium or ring* is a narrow band of tissue just below the hair at the coronet and above the coronary band. At the heels it widens and blends with the corium of the frog (sensitive frog). It secretes the periople, the external covering of the wall.

The *coronary corium or band* is a thick, strong, convex band of tissue which lies in a groove inside the top of the wall and extends around the top of the hoof. It secretes the middle or main part of the wall.

The *laminar corium* (sensitive laminæ, fleshy leaves, Pl. VII) covers and is firmly attached to the wall surface of the third phalanx and the lower part of the outer surface of its cartilages. It secretes the laminæ, the inner part of the wall. The *laminæ* (fleshy leaves)

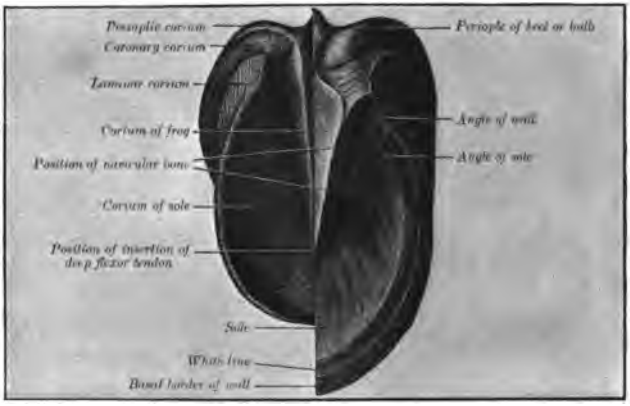


PLATE VIII.—GROUND SURFACE OF FOOT OF HORSE AFTER REMOVAL OF HALF OF HOOF TO SHOW CORIUM.

(After Schmaltz, Atlas d. Anat. d. Pferdes.)

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of the corium, in addition to supplying nourishment to the horny laminæ and the horn of the white line, through their strong union with the laminæ of the wall they support the weight of the horse on the hoof.

The *corium of the sole* (sensitive sole, Pls. IV and VIII) covers the sole surface of the third phalanx and secretes the sole.

The corium of the frog (sensitive frog, Pl. VIII) covers the lower surface of the digital cushion and secretes the frog.

**31.** The *hoof* is the outer horny covering of the foot. It is divided into three parts—the wall, sole, and frog. In the healthy foot these parts are firmly united.

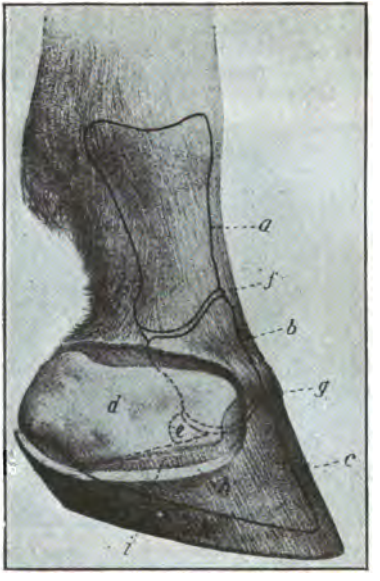


PLATE IX.—DIGIT OF HORSE, SHOWING SURFACE RELATIONS OF BONES AND JOINTS. THE CARTILAGE IS LARGELY EXPOSED.

*a*, First phalanx; *b*, second phalanx; *c*, third phalanx; *d*, cartilage; *e*, distal sesamoid or navicular bone; *f*, pastern joint; *g*, coffin joint; *h'*, cut edge of wall of hoof (*h*); *i*, laminar corium. (After Ellenberger, in Leisering's Atlas.)

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The *wall* (except the bars) extends from the edge of the hairs to the ground, and is that part of the hoof which is seen when the foot

is on the ground. It is divided into the toe, quarters, buttresses, or heels, and the bars. The *toe* is the front part of the wall. It is steeper in the hind foot than in the fore. The *quarter* extends on each side from the toe to the buttress, or heel. The *buttress* is that part of the wall where it bends abruptly inward and from which it extends forward and forms the bar. The *bar* extends inward and forward from the buttress along the frog to within about an inch of the point of the frog. The hoof is thus made stronger by the ends of the wall being extended inward. The bars are weight carriers, and they also act directly on the wall to produce expansion when weight is placed on the frog.

The wall has two surfaces and two borders. The external surface is smooth and is covered with a coat of fine horn called the *periople*.

The internal surface is covered with from 500 to 600 *laminæ*. These are thin plates of horn running downward and forward. Between them are fissures into which dovetail the corresponding laminæ of the corium. The laminæ and the corresponding laminæ of the corium are firmly united, and this union (*a*) binds the wall of the hoof to the third phalanx and its cartilages; (*b*) suspends the weight of the horse from the wall as in a sling; and (*c*) thus prevents the bones from descending on the sole.

The upper border of the wall has a deep groove in which lies the coronary corium, or band. The lower border is known as the *bearing surface, or spread.* It is the part that comes in contact with the ground in the unshod foot and to which the shoe is fitted in the shod foot.

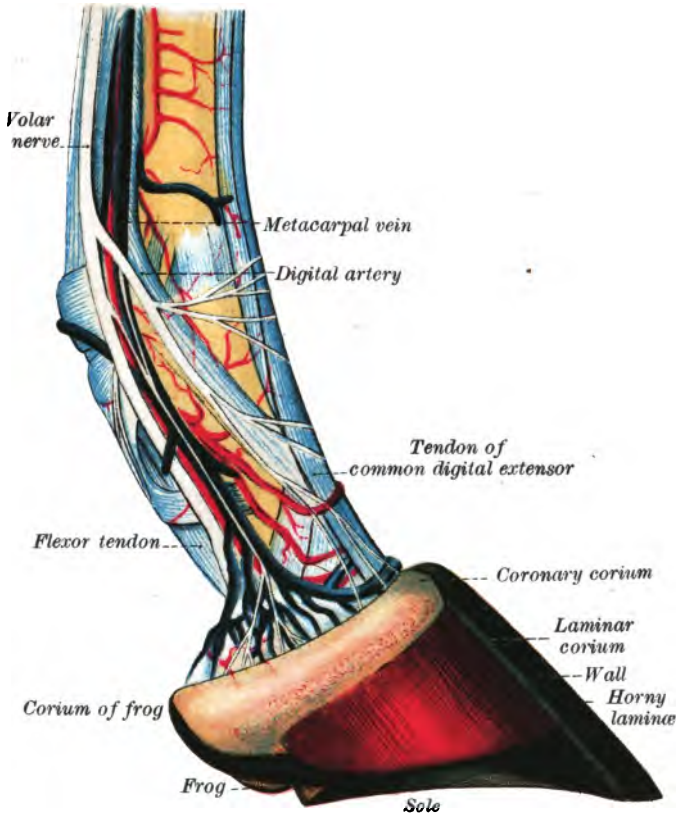
The *sole* is a thick plate of horn, somewhat half-moon shaped. The upper surface is convex. The lower surface is concave and is covered with scales or crusts of dead horn, which gradually loosen and fall off. The outer border of the sole is joined to the lower part of the inner surface of the wall by a ring of soft horn called the *white line.* The inner border is V-shaped, and is in union with the bars except at the apex of the angle, where the sole joins the point of the frog. The sole protects the sensitive parts above, and it should not bear weight, except a very narrow strip on its border along the white line, an eighth or a tenth of an inch in width.

The *frog* is a wedge-shaped mass filling the V-shaped space between the bars and sole and extending downward, more or less below the bars and sole. The lower surface has two prominent ridges, separated behind by a cavity called the *cleft*, and joining in front at the point

work above. This compression causes the digital cushion and frog to spread out to the sides, pressing outward energetically the cartilages, the bars, and the walls at the heels and quarters. This is called *expansion*. It does not occur in a foot so shod that the frog can not come in contact with the ground.

When the weight is removed from the foot the digital cushion and frog return to their normal shape, allowing the cartilages and the quarters to return to their original positions. This is called *contraction*. Upon the alternate displacing and returning of these parts of the foot, nature relies for necessary beneficial effects.

This expansion and contraction diminish the jar to the foot and leg. The action is increased as the horse increases his gait. This action also assists in the circulation of the blood through the foot. When expansion occurs the blood is forced out of the veins in the digital cushion up into the pastern region, where the valves prevent its return to the foot. When contraction occurs and the parts resume their normal positions fresh blood is drawn from the arteries for the nourishment of the tissues of the foot. For this reason the horse should have daily exercise to give the tissues of the foot their proper nourishment. When the horse is taken out to work he should be walked at first to allow the circulation to adjust itself to the change from rest to work.




FOOT OF THE HORSE.
*One-half of hoof removed*

A. HOEN & CO.

## CHAPTER V.

## NORMAL SHOEING.

By normal shoeing is meant the shoeing of a sound foot of a horse with proper gaits.

### RAISING THE FOOT.

**35.** In preparing to raise a horse's foot never approach the animal suddenly, for he will not only be startled, but a sudden pull at his foot will probably disturb his balance, and the lifting will be more difficult for both man and horse.

To raise the forefoot, the shoer stands with his back to the horse's shoulder and places his inside hand on the horse's shoulder. Then, bending over, he runs his hand gently down the back of the leg until the fingers, with the thumb on the outside, are just above the fetlock. The shoer's shoulder is pressed against the shoulder of the horse, forcing the weight upon the other fore foot. (Pl. XII, fig. 1.) A slight grasp of the hand on the tendons is usually sufficient to induce the horse to raise the foot.

The shoer next straddles the horse's leg and holds the foot upon his knees, standing so that his body is about opposite the horse's shoulder, and in close to him, so that the horse's leg is not pulled outward in a strained position. The shoer's toes should be turned in to give strength to the position. (Pl. XII, fig. 2.)

**36.** Raising the hind foot is performed in two different ways. In the first method the shoer, standing at the horse's flank and with his back to the animal's head, bends until his shoulder presses the horse's thigh, runs his hand gradually down the tendons and grasps them as in raising the forefoot. In the second method, the one generally employed, the shoer stands as in the first method, but with his outside foot advanced (Pl. XIII, fig. 1); the hand nearest the horse is placed upon the animal's hip, gently pushing him over and forcing the weight upon the opposite hind foot; meanwhile the other hand is run slowly down the back tendons from below

PLATE XII.—RAISING THE FOOT.

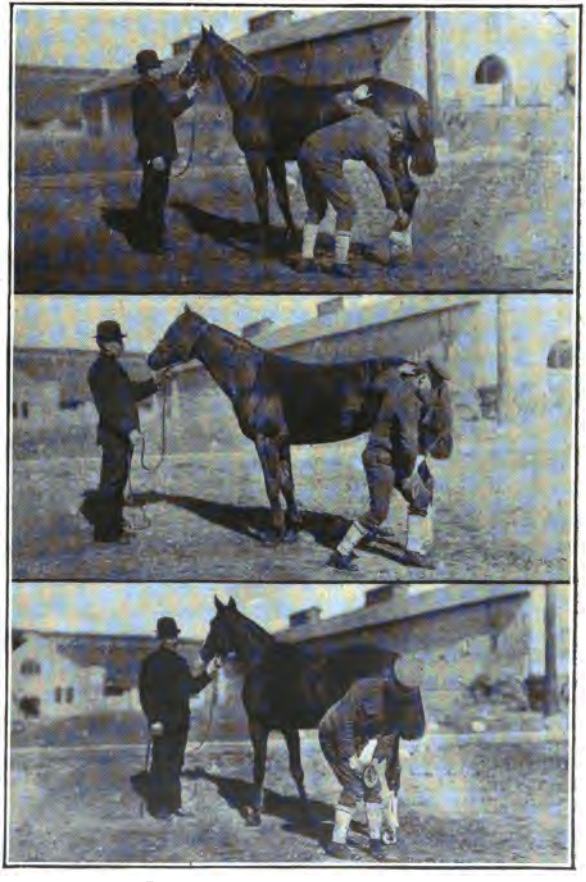


PLATE XIII.—RAISING THE FOOT.

the hock. The leg is grasped under the fetlock and is slightly raised forward. The shoer now swings his inside leg under the horse's leg (Pl. XIII, fig. 2), presses it with his knee and extends it to the rear to the position shown in Plate XIII, figure 3. Care must be exercised that the foot is not held too high nor carried too far to the rear or outward, for the discomforts of these strained positions will induce the horse to pull his leg away.

### PRELIMINARY EXAMINATIONS.

**37.** Three careful examinations should be made before old shoes are removed from the horse:

1. Of the action of the feet when the horse is in motion.
2. Of the shape and position of the feet at rest.
3. Of the evidence of wear on the old shoe.

For the first examination, the horse having free use of his head, should be led at a walk and at a slow trot upon *level* ground. Uneven ground will produce modifications of the natural gait, and a tight rein or a short hold on the halter shank will also alter the free, natural motion. The shoer assumes a squatting position and observes the feet as the horse is led past him, away from him, and toward him. The manner in which a foot leaves the ground, its path in the air, and the manner in which it is planted should be closely watched in order to detect any of the defects of gait which can be remedied by intelligent shoeing. (See Chapter VI.)

**38.** For the second examination, the horse should stand at ease on the floor; the shape of each foot and leg should be observed from the front, from each side, and from the rear, care being exercised that the leg, at the time, is bearing its proper share of the animal's weight.

The shoer first studies the natural pastern conformation. Is the pastern slanting inward (toe in), is it vertical (straight), or is it sloping outward (toe out)? (Pl. XIV, figs. 1, 2, and 3.)

Having decided this point, he then studies the position of the "pastern axis" and the "foot axis."

As seen from the front we may consider that the "pastern axis" is the imaginary line exactly splitting the long pastern in two, and that the "foot axis" is the line exactly splitting the foot in two; that is, the line from the center of the toe to the center of the coronet. (The foot axis may be drawn on the hoof wall in chalk.)

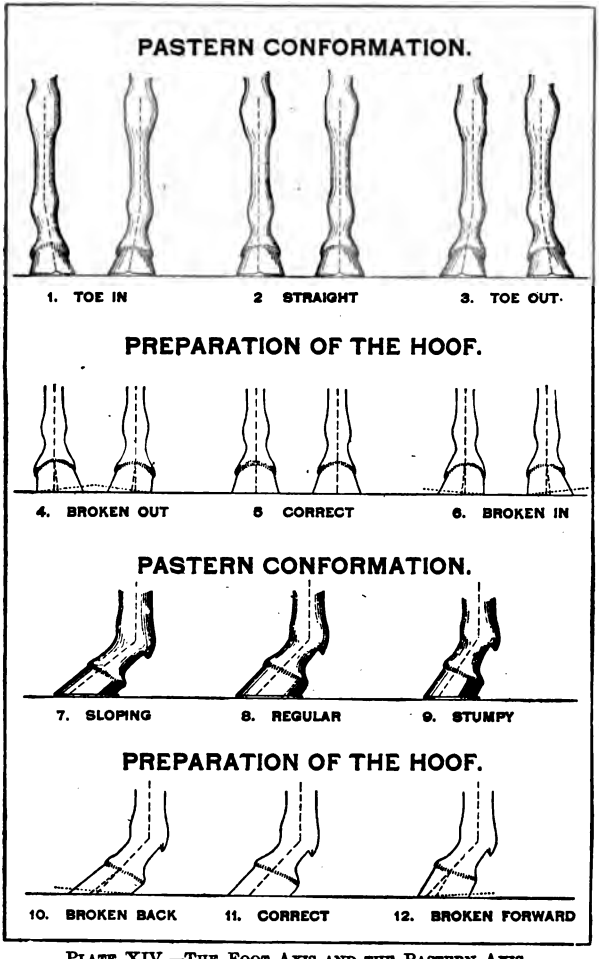



PLATE XIV.—THE FOOT AXIS AND THE PASTERN AXIS.

These two axes should be in prolongation or appear to be one straignt line *no matter what the natural pastern conformation* (figs. 1, 2, 3, and 5), and if the shoer finds this condition satisfactory he will simply need to prepare the foot evenly for shoeing, as explained later. But if the two axes do not appear as one straight line there will be a break at the coronet. This is a proof that the foot is not level and that the horse is not standing correctly. If the line is "broken out" (fig. 4) the prolongation of the pastern axis falls to the outside of the foot axis and the inner wall is too high, and the fault is remedied by nipping off more of the inside wall than of the outside. If the line is "broken in" (fig. 6) the prolongation of the pastern axis falls to the inside of the foot axis and the outside wall is too high and should be trimmed down more than the inside. The dotted lines in the figures show the amount to be trimmed off.

It will be noticed that the "broken out" foot *looks like* the "toe in" and the "broken in" foot *looks like* the "toe out," but in the natural conformations there is no break at the coronet.

**39.** Standing at the side, the shoer should notice the height of the foot, the length of the toe, and the slope of the line of the toe; that is, the front line of the hoof as seen from the side.

Here, again, we have three cases of natural pastern conformation: The "sloping," the "regular," and the "stumpy" (figs. 7, 8, and 9); but the line of the toe should, nevertheless, be parallel in each case to the pastern axis as seen from the side.

By careful sighting from the side, draw a chalk line between the second and third clinches, with exactly the same slope as the line of the toe. This mark will generally have the same direction as the horn fibers. Now stand back and determine if this mark and the "pastern axis" as seen from the side are one and the same line. If so, trim off the surplus growth evenly. If not, the line will be broken at the coronet. In "broken back" (fig. 10) the prolongation of the pastern axis falls to the rear of the foot axis and the toe is too high and should be trimmed more than the heel; in "broken forward" the prolongation of the pastern axis falls in front of the foot axis and the heels are too high and should be trimmed more than the toe.

The "broken back" *looks like* the sloping pastern and the "broken forward" *looks like* the stumpy pastern. The break at the coronet, however, is the sure guide.

For the third examination the foot must be raised.

**40.** The wear of the old shoe should be carefully noted as a check on the preceding two examinations. If the shoe has worn evenly, its position on the foot was undoubtedly correct. If one side of the shoe shows more wear, (*a*) that side may have been fitted too closely; (*b*) there may be some fault in gait which should have been noted in the first examination; (*c*) the foot may not have been properly leveled in the last shoeing; (*d*) the quarters, as frequently happens, may have grown unevenly since the last shoeing. Horses with long, sloping pasterns wear the shoe more at the heel, while those with short, upright pasterns wear the shoe more at the toe. There is a slight scuff at the moment of breaking over, which produces a normal wear at the toe, but overworked horses and those suffering from disease show more than this normal wear.

### REMOVAL OF THE OLD SHOE.

**41.** The clinches are cut off or straightened with the clinch cutter and hammer. The sharp edge of the clinch cutter is placed under the edge of the clinch and struck with the hammer until the clinch turns up flat against the wall or is broken off. If even one clinch is left holding it may break off the portion of the wall to which it is fastened.

Beginning at the heel, each side of the shoe is loosened with the pincers and, gradually working toward the toe, is separated from the hoof until all the nails are free except those at the toe. The shoe is firmly grasped at the toe with the pincers and is pulled toward the center of the foot. If pried over the toe toward the outside of the foot, part of the hoof may be broken off. Any stubs of nails remaining in the foot must be removed.

### TO PREPARE THE FOOT.

**42.** With the horse standing evenly on its feet, examine the foot and pastern axes to determine the necessary changes, if any, to be made besides the removal of the surplus growth of horn. Then taking the knife in the right hand, back of the hand down, the blade coming out at the little finger, palm of the left hand supporting the wall of the hoof and the left thumb on the blade to assist in cutting and to prevent slipping, pare away the dead horn *near the white line* until live horn is reached, being careful *not to go farther back than the last nail hole.* This is done to ascertain the amount of horn that may be removed and to facilitate the use of

the nippers. The knife must never be used on the bars or the frog. The bars strengthen the hoof and assist in its expansion. Cutting, therefore, weakens them and prevents them from performing their function. *Never* use a knife on the hoof of a horse that has been running barefoot, nor on flat feet, either natural or diseased.

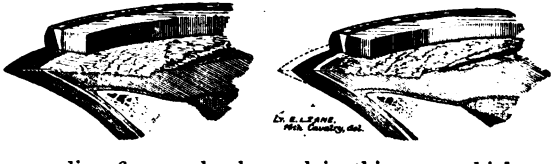
Ragged parts of the frog may be cut away by careful use of the nippers.

In removing surplus growth of horn it is safer to lower the toe first, for, if the heels be lowered and, later, it is found that a corresponding amount of horn can not be cut from the toe, it will be impossible to put the foot at the proper angle without the use of heel calks or a thickened web at the heels.

Taking the nippers in both hands so that the handles are perpendicular to the plane of the bearing surface, begin at the last nail hole and cut until the white line shows plainly and live horn has almost been reached; start with a thin cut or bite and gradually increase the depth of bite to the point of the toe; continue along the opposite wall to the last nail hole on that side, gradually diminishing the bite.

**43.** Heavy horses with wide feet and horses raised on soft, marshy pastures usually have flat feet. The *natural* flat foot, although particularly liable to bruises of the sole, must be classed as a sound foot and must be distinguished from one that is flat as a result of disease.

On account of its shape, the natural flat foot is sometimes called "flare foot." The wall in such a foot wears away (or is trimmed away) at a more oblique angle than in the ordinary upright foot, and it is therefore frequently necessary, in the preparation, to remove a part of the outer edge of the wall in order that the nails may be driven in the white line where they belong.



The preceding figures clearly explain this case, which must be remembered as the *only case* where it is permitted to rasp the outside of the wall.

**44. In general.**—The foot should be prepared so that it will approximate as nearly as possible to a state of nature, and only such trimming is allowed as is absolutely necessary for the purpose of fitting and securing the shoe.

TO LEVEL THE FOOT.

**45.** Grasp the rasp with the right hand, the left hand near the far end, left palm resting on the upper surface to act as a guide. Place the coarse side of the rasp against the ground surface of the wall on the right half of the foot, and with long, even strokes, smooth off the foot where it has been cut with the nippers. Then work on the buttress and bring it to the same level as the quarter and toe, removing such horn as may be necessary and no more. Beginners usually bear too strongly with the right hand and remove more with the hind part of the rasp than with the front part. Avoid this fault. Frequent tests should be made to avoid removing too much of the horn. For this purpose, take the foot in both hands and press with the thumbs near the white line; if the sole yields ever so slightly no more horn should be rasped away or lameness will result. Work carefully and slowly on the flat foot, which has a thinner sole than the cup-shaped foot.

For the left half of the foot reverse the hands on the rasp and proceed as above. This half will be found more difficult at first on account of the awkward position, and as a result the work will often be slighted. Experience with beginners shows that the right-handed man leaves the left half too high four times out of five.

To determine the level of the foot, the shoer raises the foot to a position for sighting over the bearing or ground surface; let the foot hang naturally and do not press against it with the thumb, as this is apt to disturb the pastern and foot axes and make the foot appear level when it is not; sight over each side separately, from the buttress to the toe, and note any irregularities which may appear in these two surfaces; now continue the plane of the quarter and heel, on one side across or through the horny frog to the opposite side of the foot, for the purpose of determining whether or not the two sides are in the same plane. This may be done with the eye by drawing an imaginary line, or by placing the smooth surface of the rasp on a level with the bearing surface of the foot, as indicated by the line *e—f*. To determine the level of this plane, draw an imaginary vertical line through the cleft of the frog, as shown by the line *c—d*. If

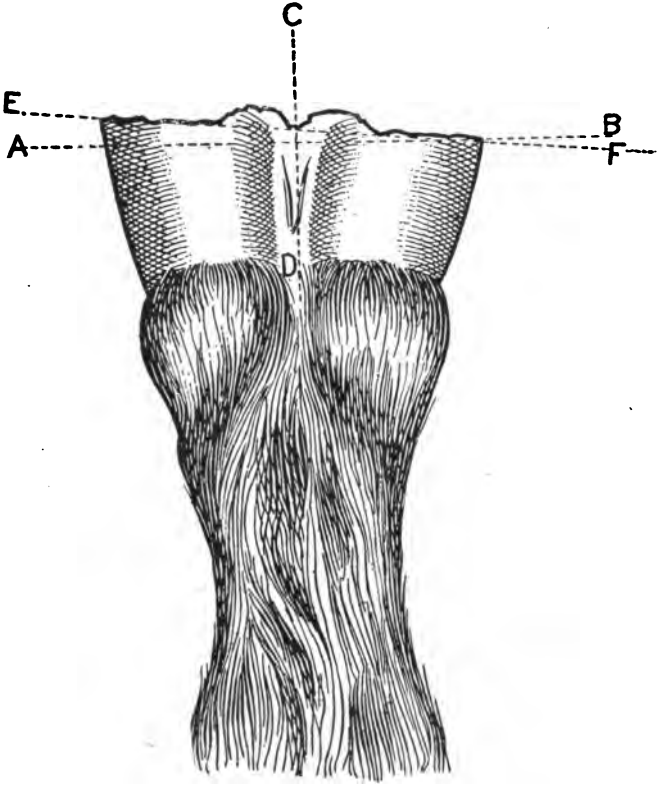



PLATE XV.—LEVEL OF THE FOOT.

the latter line (*c—d*) is perpendicular (forming right angles) to the line *e—f*, the plane of the foot is level. Both sides may be in the same plane and the foot not level. In such a case the plane is canted. The line *e—f* represents a canted plane, and it will be noted that it does not form right angles with the vertical line c—*d*. The true or level plane will be found at the line *a—b*, which line forms a perfect right angle with the line *c—d*. (Pl. XV.)

**46.** Place the foot on the ground and examine it from all sides and note carefully the following: Does the foot stand at the prescribed angle; are the quarters equal in height; is the foot either broken out or broken in? If any of these conditions is not correct, the necessary changes should now be made.

When the leveling of the foot is completed, observe whether the sole is level with the wall at the inner angle of the buttress; if it is, remove a thin plate of horn, not over an eighth of an inch thick, with the knife, being careful not to cut the walls or bars. This is to prevent pressure on the sole, which might result in corns at this point.

**47.** Plate XVI shows the appearance of a foot before and after preparation. This is the near forefoot of a field artillery wheel horse, and was selected on account of the clearly defined bars. It is to be observed that in leveling the bottom of this foot, it being a case of flat foot, the rasp trims off the sole inside of the proper weight-bearing surface. The shoe should *bear* upon the latter surface only.

### THE SHOE.

**48.** When horses are in constant use, it is necessary to prevent the too rapid wear of the hoof. The modern shoe, beyond all question, is the best means to accomplish this result, although it seriously interferes with the natural contraction and expansion of the foot. When shoes are left on the feet for too great a length of time, corns and other ailments result. Ordinarily a shoe should be renewed once a month. The heavier the shoe, the greater the labor of the horse. Hence, except in special cases, the lightest shoe that will last about four weeks is the best shoe. The shoe should carefully follow the form of the foot. If the foot is broken, the shoe follows the original shape of the foot. The upper and lower surfaces of the shoe should be wider at the toe than at the heels. At the toe the width should be about twice the thickness of the wall of the hoof at that point. The length of the shoe is regulated by

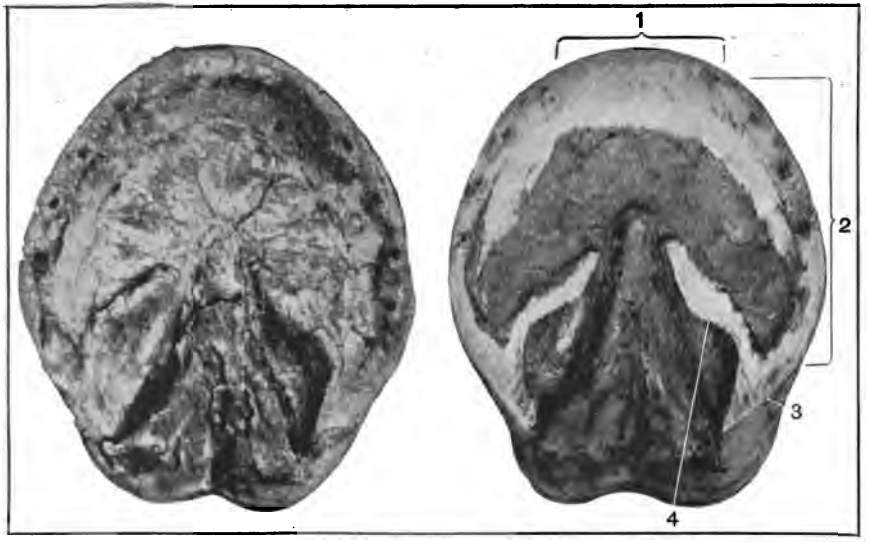



PLATE XVI.—PREPARATION OF THE FOOT.

Appearance after old shoe is removed.

The foot ready for the new shoe.
1, toe; 2, quarters; 3, buttress or heels; 4, bars.

the bulb of the frog, and the thickness of metal is made sufficient to wear about one month.

The ground surface of the shoe should be level. That portion of the upper surface which presses against the bearing surface of the foot must be level, smooth, and accurately shaped to support it, and when the upper shoe surface is wider than the bearing surface the inner edge must be *concaved to avoid excessive sole pressure*. This is one of the most important requisites of correct horseshoeing. Care must be taken only to concave enough to remove sole pressure. Do not leave too much space between the shoe and sole, for this allows small pebbles, grit, and dirt to collect, which allows sole pressure at small points, which is very harmful. Concussion of the sole against the inner edge of the upper shoe surface invariably produces soreness. The outer edge of the upper surface should be slightly rounded. This adds to the appearance, produces a better fitting shoe, and to a marked degree prevents cutting if the horse travels close. The width of the crease of the shoe should be uniform, and its depth about two-thirds of the thickness of the shoe. The crease makes the shoe lighter in proportion to its width and is an aid to prevent slipping. Nail holes should be punched to fall over the outer edge of the white line.

Clips are semicircular ears drawn upward from the outer edge of the shoe to prevent its slipping. A clip extends above the upper surface a distance equal to the thickness of the shoe, or sometimes farther on hind shoes. When leather is interposed between the shoe and the bearing surface, the clip must be correspondingly raised. Toe and side clips assist the nails in holding the shoe in place.

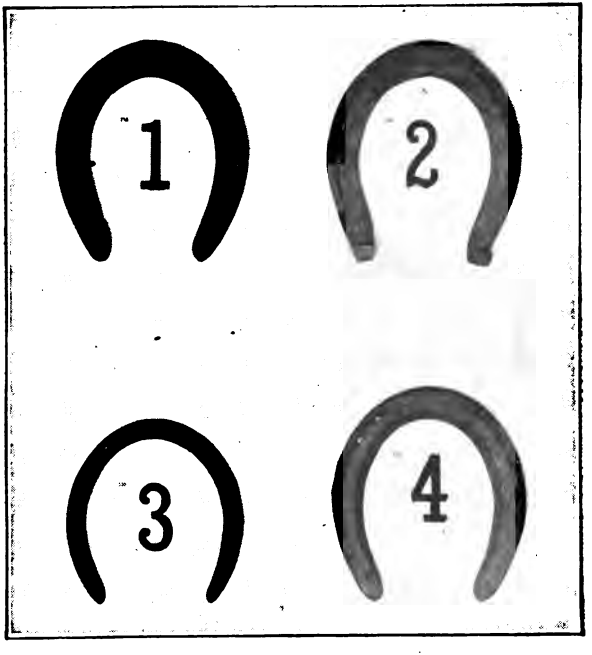
### NORMAL SHOES.

**49.** By a normal shoe is meant a shoe for a sound foot of a horse with proper gaits. The service shoe (Pl. XVII, fig. 1) is, of course, a normal shoe.

In the mounted service four sizes of machine-made shoes are issued. It will be noted that the heels are much longer than necessary, but they are manufactured in this manner so that the extra length can be used in turning heel calks or in making a bar shoe. It often happens that a larger size is required for the front than for the hind foot of the same horse.

Three other shoes belong to this class:

The *calked shoe* (fig. 2) is used to enable the horse to secure firm footing on slippery or ice-covered roads. Its use must be confined




1. The service shoe.
2. Calked shoe.
3. Plate.
4. Snow shoe.

PLATE XVII.—NORMAL SHOES.

to actual necessities, for the calks raise the frog from the ground and prevent natural expansion and contraction. Permanent contraction of the heels, and even sidebones, result from the *constant* use of this shoe.

Sharpened calks, for use on ice, are even more to be avoided on account of injuries caused by interfering and by kicking.

The *plate* (fig. 3) is merely a light-weight shoe turned from bar steel.

The *snow shoe* (fig. 4) has a smooth, concave ground web, which, to a great extent, prevents the accumulation of snow and mud, and also gives firmer footing. The figure shows a shoe turned from the issue shoe.

THE SERVICE SHOE.

**50. Selecting the shoe.**—The foot having been prepared, leveled, and made ready for the shoe, estimate the size of the shoe required. To do this it is necessary for the beginner to place it on the foot and note the position of the nail holes, being careful not to take a shoe in which the last nail hole will be in the rear of the bend of the quarter. Take the lightest shoe of the desired size that may be available.

*Now* examine the pritchel, and if it is not of the proper shape point it. (*See* Tools.)

**51.** The successive steps in fitting the service shoe should always be taken up in the following order:

1. Draw the toe clip.
2. Make the necessary changes in the toe.
3. Concave the shoe.
4. Open the nail holes.
5. Shape the quarters.
6. Cool and make the first trial for fit; at this time make the seat for the clip.
7. Make any change in outline.
8. Draw the heels.
9. Cut off the heels.
10. Finish the heels.
11. Go over concaving and level the shoe.

**52. Drawing the toe clip.**—Fitting hammers with two different styles of peen are considered in this work. The one with the round-edged end to the head of the hammer, is shown in the following

cuts. For the fitting hammer, with spherical peen, see Plate I, paragraph 1. Having procured a shoe of the desired size and having noted the general changes to be made in its shape, especially at

the toe, place the toe of the shoe in the fire, ground web down. When the toe is white hot take the tongs in the left hand, seize the shoe near the heel on the side nearest you, remove it from the fire

and place it on the face of the anvil ground web up, center of toe projecting over the anvil about an eighth of an inch, heels held at an angle of about 30°. With smart strokes with the peen of the hammer drive down the center of the toe until a small shoulder appears underneath; place this shoulder against the far edge of the anvil, holding the shoe so that the heels form an angle of about 45° below the face. Hold the right hand low and with strokes toward you along the face of the anvil, using the heel of the face of the hammer, draw out the toe clip, bringing the heels closer to the anvil as the clip is drawn. Be careful that the clip is in the center of the shoe. The clip, when finished, should be a little higher than the thickness of the shoe.

**53. Fitting.**—The toe is then opened, as may be necessary (par. 19), being careful not to injure the clip. To open the toe of a large

shoe where the horn of the anvil is too small for the usual method, hold the shoe as shown in paragraph 19, but pull the quarter on the side opposite you firmly against the horn. Then strike on that quarter near the toe, bringing the hammer toward you and keeping up the pull on the tongs. The other side is opened in a similar manner after reversing the shoe. This method is frequently used in fitting the very large shoes required for horses of siege-gun batteries, etc.

In the service shoes it will not be necessary to use the countersink for nail holes, because the crease is wide enough to take the nailhead. Use the pritchel to open the holes, as in paragraph 15, but pritchel

the upper surface *first* in order to give the nail holes the proper slope and to remove the slight burr left on the machine-punched shoe, and the lower surface *last*, so that the hole will be finished in the shape of the nail. For the first work the shoe may be placed anywhere on the face of the anvil, because the service shoe is thick enough to prevent any chance of spoiling the point of the pritchel; but for the last work the pritchel or hardy hole must be utilized, as previously explained. The toe clip generally makes it difficult or impossible to place the nail hole nearest the toe over the pritchel or hardy hole. For these nail holes shift the shoe to the nearest end of the face of the anvil and hold the nail hole slightly outside of the edge.

It will generally be found that the work up to this stage can be done with the heat remaining from that required for the toe clip. Beginners, however, may find it necessary to reheat the shoe in order to open the toe. In this case, place the shoe in the fire with the clip up, to avoid burning it.

Cool the shoe and apply it to the foot. In order to secure a neat fit at the toe it is necessary to make a seat for the clip, which otherwise will stand out its full thickness. Now is the time to prepare this seat. Place the shoe in position with the clip accurately centered, and, using the knife, scratch a small mark on the edge of the wall at each end of the clip. Put the shoe aside and *carefully* whittle away the edge of the wall between the two marks. Work slowly and test frequently by replacing the shoe, so that you will cut away just what is necessary and no more. (*See* Seedy toe, par. 86.)

Now make the first trial of the fit. If the toe is correct, note where either of the sides needs reshaping. The quarters will usually be found too full, and if so must be heated and shaped over the horn by the method explained in the plate shoe, except that the shoe is slightly turned so that blows will fall on the *edge* of the upper surface in order to avoid closing the crease.

The outline of the finished shoe must exactly follow the outer edge of the hoof to the last nail hole, and gradually widen from that point so that about an eighth of an inch of the upper surface will show at the end of the heel. If, however, a foot is found to have a portion of the wall broken off when the animal is brought to the shop, the shoe must be fitted so as to follow the original outline of the wall. Fitting the shoe so that the nail holes will fall on the outer edge of the white line is a good guide for outline in the case of

a bad break. If the toe has been broken, the shoe is fitted as just explained, but, of course, there are no nail holes to act as a guide. The toe clip is omitted and side clips are used if necessary.

The bearing surface of the shoe, upon which rest the wall, the white line, and not more than an eighth of an inch of the sole, must be level, fit exactly to the hoof (without any air space), and extend back even with the bulb of the frog. The part of the upper surface inside of this bearing surface must be concaved (hammered down while the shoe is hot) in order to avoid *any possibility* of sole pressure which would produce lameness. At the heels there should be no concaving, but the sharp inside edge should be *slightly* rounded. (Par. 89.)

The width of the heels of all finished shoes must conform to the width of the buttress. In shoeing a foot with a very wide buttress it is often unnecessary to draw the heels at all, but in most cases they must be drawn as explained in the plate shoe. (Par. 12.) Remember that the bearing surface of the shoe *must cover the buttress* and you then have a guide for the width of the drawn heels.

In the issue shoe, the outer edge is beveled as far back as the end of the crease, but is square from that point to the end of the heels. In *finishing* the shoe, bevel the square part also.

### THE CALKED SHOE.

**54.** The service shoe, as previously explained, is issued with heels sufficiently long to permit its conversion into a calked shoe.

**To turn in a heel calk.**—Heat the heel to a white heat. Remove the shoe from the fire with the tongs holding it near the toe; place the shoe at any convenient part of the face of the anvil with the ground surface down, a half to three-quarters of an inch of the heel projecting over the heel of the anvil. Strike on the part of the heel projecting over the edge and turn it at a right angle to the shoe. The height of the heel calk should correspond to that of the toe calk. The calk is squared by working on the face of the anvil; place one side on the face and strike on the upper side.

**To weld on the toe calk.**—The issue toe calk has a sharp nib or point on that surface which is applied to the ground surface of the shoe. Heat the toe of the shoe to a white heat and, placing it on the face of the anvil with the ground surface up, hold the calk with the tongs across the toe and far enough back so as to allow for turning the toe clip. Strike a few light blows to drive the nib into the shoe until the calk and shoe are touching.

Return the shoe to the fire, calk up, and tilt or rock the shoe forward and back to insure equal heating of both shoe and calk. When the proper heat—fluxing—(*see* Heats) has been obtained, place the shoe on the face of the anvil as before and strike a few light blows on the calk.

Reheat to the welding heat and place the calk on the face of the anvil. Strike a few heavier blows on the upper surface of the shoe directly over the calk.

**Fitting.**—The calked shoe is fitted in the same manner as the service shoe, with the exception that the heels are made a little longer and are slightly turned out from the end of the buttress in order to give a wider support to the foot and to thus prevent as far as possible the rocking of the shoe. For use on ice the calks are sharpened, but a horse so shod must never be turned loose with other horses.

The use of the calk shoe is prohibited except at times when local conditions make its use absolutely necessary to prevent slipping.

### NAIL DRIVING.

**55.** The nails issued in the mounted service are machine-made, and the sizes in general use are Nos. 4, 5, 6, and 7. No. 4 nail is used for plate shoes; No. 5 nail for a No. 1 and 2 shoe; No. 6 nail for a No. 3 and 4 shoe; No. 7 nail for the large feet of some artillery horses.

One side of the shank of the nail is flat; the other side is concave and also has a bevel near the point. This bevel, as it enters into the horn, forces the point of the nail in the direction of the other side (flat side). Therefore always hold the nail with the *flat side toward the outside edge of the shoe.*

By driving nails into the wall of the foot some of the horn tubes are destroyed, and the higher the nails are driven the greater the injury to the wall. Nails should, therefore, come out at a height just sufficient to hold the shoe—not exceeding one inch—and in order to damage the wall as little as possible, both the size and the number of the nails should be as small as will accomplish this object.

The outside of the white line is the correct place to start the nails, and shoes should be fitted with this end in view. Nails thus started come out evenly on the wall, are low, and at a strong angle.

To the experienced shoer the feel and the sound of the nail and the amount of force required in driving are important guides.

The nail is held between the thumb and fingers to steady it in starting, and, if going properly, it imparts to the fingers a character-

istic sensation called the "feel of the nail." A nail driven into healthy horn gives off a distinct sound which the shoer soon learns to recognize. All nails going properly must be driven with considerable force. A nail driven with slight resistance, i. e., "going easy," is either in an old nail hole or *serious damage* is being done because the nail is entering the soft sensitive structures of the foot (pricking).

Nail heads must be sunk in the crease until they are flush with the ground surface of the shoe. If this is not done, the heads may project unevenly and throw the foot off the level. They will also wear quickly and cause a loose shoe.

### SECURING THE SHOE.

**56.** The shoe is placed upon the bearing surface of the foot and held firmly in position with the left hand, back up. A nail is placed between the thumb and forefinger of the left hand, *the flat side faced outward*, and the thumb and the fingers are then extended along the right side of the shoe until the nail is held squarely in the center of the most convenient nail hole, usually the third (the third hole on the left side for a left-handed man); with a toe clip on the shoe the second nail hole is generally used. The nail head is tapped lightly with the driving hammer. The nail should be held firmly to determine the feel, and the thumb and forefinger should not be removed until the nail, going soundly, needs no further guidance. The shoe is then grasped more firmly and the nail is driven with slightly increased force. The fingers, placed on the wall of the foot, determine the exact location at which the nail emerges.

With the claw of the hammer the point of the nail is then bent upward until it stands at a right angle to the wall. Next, the head of the hammer is grasped in the hand and the claw is pushed firmly downward, clutching the nail point. A half turn downward and a slight pull wrings the point off close to the wall, leaving enough nail to form the clinch. In wringing off nails the hammer is held in the hand nearest the nail point.

As the first nail when driven may cause the shoe to shift, it is essential to place it exactly in the center of the nail hole. If the shoe has altered its position on the foot a pressure on the opposite side of the shoe by the palm of the hand and a few light blows of the hammer on the lower border of the wall where the first nail is driven will move the shoe back to place.

The second nail should be driven on the side opposite to the first nail. When these two nails have been driven the foot should be allowed to rest upon the floor, and the foot and shoe should be carefully examined from all sides. Is the position of the nails correct? Is the foot axis correct? Does the shoe fit properly? Is its length correct? Does the horse stand evenly upon the ground surface of the shoe? The shoer should not resume his task until he is satisfied in all particulars. If any irregularities exist this is the time for correction. When the shoe has been properly set drive the remaining nails, the fourth nails on either side being driven first. As each is driven *the point is promptly wrung off*. When all the nails have been driven the heads are forcibly hammered well into the crease, securing the shoe evenly upon the foot.

The clinching block is then placed under a nail point. When the driving hammer strikes the nail on the head the nail point is turned upward and the clinch is formed.

After all the clinches have been formed the foot is brought forward upon the knees. (See Pl. XII, fig 3, for front foot, and accompanying figure for hind foot.) With the rasp the clinches are made of equal length, being in length about the width of the nail at this point. The end of the nail is brought to a thin edge by filing off the corner on the underneath side and thus forming a short bevel which assists in making the clinch smooth with the wall. A *slight* groove is made in the wall under each clinch. With the clinching block held firmly under each nail head in turn, the clinch is bent

down and hammered in with the driving hammer. It is well to clinch the inside of the foot first, thus removing danger of the upturned clinches tearing the opposite leg. Finally, the smooth side of the rasp is run lightly over each clinch to take off the rough edges that would pick up bedding or other material. Much filing of the clinches weakens them and results in a cast shoe. When finished the clinch should be a trifle longer than the width of the nail at the point where it comes out of the wall.

The outside wall of the foot *is never rasped* (par. 46).

The toe clip should be hammered back against the wall of the toe after the inside has been clinched on the off feet and the outside on the near feet. In other words, hammer back the toe clip when the right arm is free.

After the shoeing has been completed the foot is again allowed to rest upon the ground, and again carefully examined from all sides.

Plate XVIII shows the near forefoot of a newly purchased Cavalry horse. The shoe, as may be seen, has been on for about three months, and the foot is broken back. The lack of symmetry at the heels shows that the shoe was probably not correctly fitted, and that it certainly was not in proper position when nailed on.

The shoer, having learned to fit normal shoes, is prepared to take up the study of shoeing to correct faults in gaits and shoeing as an aid in the treatment of diseased feet.

### INSPECTION OF SHOEING.

**57.** The horses shod during the day should be ready for inspection at afternoon stables, or other convenient time, in the shop or stable, with their feet cleaned.

The horse should be examined on a level floor, as otherwise it is impossible to determine whether he is standing correctly or not.

The following examination should be made while the foot is on the ground:

(*a*) *Pastern and foot axes.*—View the foot from the front and side to determine whether the axes are correct. (Pl. XIV.)

(*b*) *The fit of the outline of the shoe.*—Does it correctly follow the outline of the wall to the last nail hole, and from there extend outward, allowing proper space for expansion? (Par. 53.) Note particularly whether the wall has been rasped to fit the shoe. (Par. 43.)

PLATE XVIII.—FOOT IMPROPERLY SHOD AND NEGLECTED.

(*c*) *The toe clip.*—Is it in the center? Is it of sufficient strength, height, properly finished and seated? (Pars. 48 and 53.)

(*d*) *The nails.*—Are they evenly driven, the proper height and distance apart? Have any old nail stubs been left in the wall? (Pars. 55 and 56.)

(*e*) *The clinches.*—Are they of proper size? Are they well turned and set in? Are they smoothed off and not rasped sufficiently to weaken them? (Par. 56.)

The foot should then be raised and the examination continued in the following manner:

(*a*) *The shoe.*—Is it the proper size and weight? The last nail hole not farther back than the bend of the quarter? (Par. 50.)

(*b*) *The preparation of the foot.*—Has enough horn been removed? Has too much been removed? (Par. 42.) Is the foot level? (Par. 45.)

(*c*) *Bearing surface of the foot.*—Does the shoe rest evenly on the wall, covering the buttress and showing no air spaces at any point? (Par. 53.)

(*d*) *Concaving of the shoe.*—Is the shoe properly concaved? No sole pressure at any point? (Par. 53.)

(*e*) *Use of the knife.*—Has the knife been used on the bars, sole, or frog? (Par. 42.)

(*f*) *The nails.*—Are they well seated in the crease? Are they the correct size? Are they all of the same size? (Pars. 55 and 56.)

(*g*) *The heels of the shoe.*—Are they the correct width and thickness, properly rounded, without sharp edges or points? Is their length even with the bulb of the frog? (Pars. 14 and 53.)

In cases where animals have been shod with calk shoes the following should also be noted:

(*a*) *Toe calk.*—Is it properly secured and of proper height and length?

(*b*) *Heel calk.*—Are they of the same height as the toe calks? Are they properly turned and finished?

After becoming accustomed to making the daily inspection, the time necessary should not exceed five minutes for each horse.

## CHAPTER VI.

## GAITS—SHOEING TO CONFIRM OR ALTER SAME—FAULTS IN GAITS—SHOEING TO CORRECT SAME—THE MAKING OF SPECIAL SHOES FOR GAITS.

**58.** In shoeing horses for the purpose of confirming or altering gaits, it must be remembered that there are almost as many variations in gaits as there are horses, and that methods which are suitable in one case may be unsatisfactory in another. There are certain important principles which, properly applied, will be of material assistance in gaiting the majority of horses. Shoeing alone will not always accomplish the desired end, but it always helps. To shoe a horse so that he will be properly balanced and will travel squarely requires skill, patience, and careful use of special shoes. Where weight is used, it is always best to start with a small amount of weight and gradually increase it until the desired result is accomplished; otherwise injuries may result from overtaxed, strained, or ruptured ligaments.

When all four feet have been shod, the animal is taken out and again examined on level ground at a walk, trot, and gallop.

The horseshoer must bear in mind that seldom will shoeing alone produce the desired gait or action, but that much depends on proper riding and on the physical condition of the horse.

In all cases of shoeing to prevent injury to a leg or foot by another, if, with careful riding, moderate correction methods in shoeing do not accomplish the desired results, shoe normally and use boots to protect parts liable to injury.

The use of boots or bandages will render blows of one foot against another foot or leg painless, give the horse confidence, and if the blows are mild, with the use of boots they will only slightly affect his gait.

**59.** The gaits in the Army are the walk, the trot, and the gallop.

### THE WALK.

**60.** At the walk the horse lifts one foot at a time, in diagonal sequence, as, left front foot followed by right hind foot, and plants them in the same order.

### THE TROT.

**61.** The trot is a diagonal movement, in which two feet leave the ground and again strike the ground at the same time, as, the left front foot and the right hind foot. If the horse shows a tendency to single foot, the toe-weight shoe in front (Pl. XX, fig. 2) is often of benefit. The toe weight increases the length of the stride and gives a long, reaching swing to the front feet. After the horse trots steadily the toe weight may be gradually decreased and finally abandoned.

### THE GALLOP.

**62.** The gallop is a gait in which the horse springs into the air from one front foot and has all four feet off the ground at once. The diagonal hind foot is the first to strike the ground, then the other hind foot, next the front foot opposite the one from which the spring was made, and last the foot used for the spring.

Animals that are so frequently used at the gallop as Army horses should carry as light a shoe as practicable.

### THE PACE.

**63.** The pace is a lateral movement—that is to say, a movement in which two feet on the same side leave and strike the ground at the same time. If a horse shows a tendency to pace, it is often of benefit to shoe the front feet with a medium-weight shoe, well rolled at the toe, or a roller-motion shoe (Pl. XIX, fig. 3). A confirmed pacer can very rarely be converted to the trot by shoeing alone, it being generally necessary to use hobbles, uniting diagonally a front leg and a hind leg. The pacer should have no place in the service, but, if present, should be shod with a normal shoe.

### THE SINGLE-FOOT.

**64.** The single-foot is an irregular gait in which the front feet move in the order of a slow trot and the hind feet at a fast walk. Each foot strikes the ground singly. The action of the front feet is high, and there is a lateral swing to the hind feet.

To convert a single-footer into a trotter, use heavy toe-weight shoes in front and ride the horse with a loose rein and an easy bit up a gentle slope. Just as the horse increases the gait from the

walk, the rider should seize one of his ears. It is found in practice that this plan distracts his attention and allows the weighted shoes to produce the effect intended. Whenever the horse returns to the single-foot, he should be brought down to the walk and started again with the grasp on the ear. This method may sometimes be found of use, but, like the pacer, the single-foot horse should have no place in the service.

**65.** When a horse has been shod to improve his gait, he should be ridden with the snaffle bit, which admits of greater freedom of movement. The reins should be held with a light hand, and the horse should be forced up against the bit by the use of the legs.

### CORRECTING FAULTY ACTION.

**66.** It is a well-established rule in shoeing that, in order to correct faults in gaits, the shoer should proceed gradually from one extreme to the other.

### FORGING.

**67.** Forging, or clicking, is a fault in gait at the trot, the toe of the hind foot overtaking and striking the bottom of the forefoot.

**Causes.**—Faulty conformation; horses with short bodies and relatively long legs; horses with the front or hind feet set too far under the body. Leg weariness, a condition caused by debility or overexertion. Improper preparation or shoeing that tends to slow the action of the front feet, as feet with toe too long or heels too low; shoes too long or too heavy. Preparation or shoeing that tends to increase the action of the hind feet, as feet with toes too short or heels too high; shoes with heel calks and no toe calk. Rough ground and poor horsemanship; the reins held too loosely, the horse not being kept up to the bit.

**Remedies.**—To correct this defect by shoeing, the object of the shoer is to quicken the action of the front feet and to slow the action of the hind feet.

Three methods for the correction of forging are given. The first method is a mild corrective treatment, while the third is adopted only as a last resort.

*First or mild method.*—For the front feet, lower the toes and leave the heels a trifle high. The heels of the hind feet should be lowered and the toes left a trifle long. The front shoes should be light in weight; the heels of the shoe fitted short so as to just cover the but-

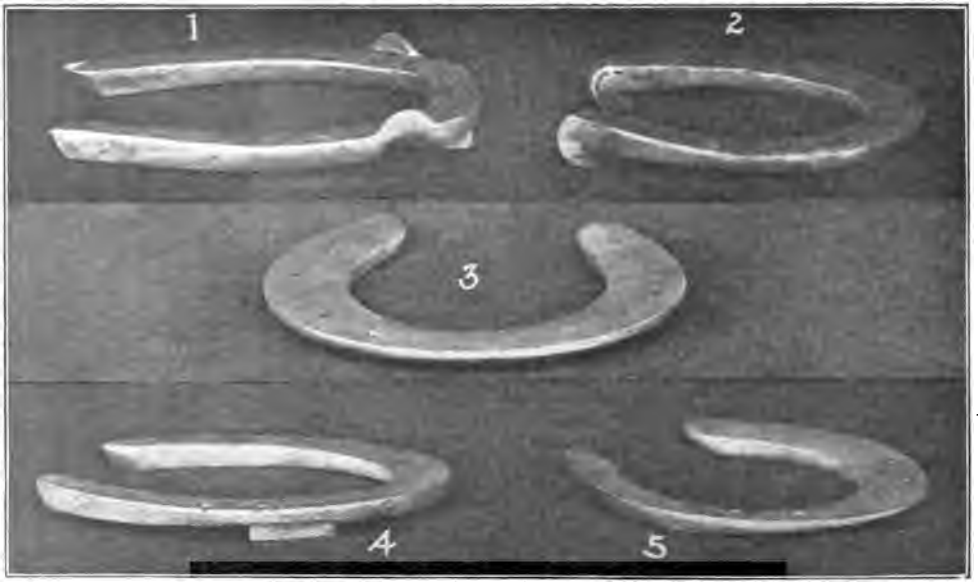



PLATE XIX.—SPECIAL SHOES FOR CORRECTION OF FAULTS IN GAITS.

tress; the toe of the shoe rolled to its full extent (Pl. XIX, fig. 5), to increase the rapidity with which the foot breaks over. The hind shoes should be a trifle heavier than the front shoes, and the heels left a trifle long. In order to prevent the noise made by the striking of shoe on shoe, should the feet occasionally meet in action, the hind shoe should be squared at the toe and fitted so that about three-quarters of the wall at the toe projects over the shoe.

*Second or medium method.*—Normal preparation of the feet. Use a fairly heavy toe-weight shoe (Pl. XX, fig. 2) in front and heavy side-weight shoes (Pl. XX, fig. 1) on the hind feet, the weight and trailer being on the outside. The effect of the toe weight is to increase the forward extension of the feet with low action; the side weight and trailer on the hind feet induce an outward swing of the foot and leg, thus giving the front feet more time for breaking over and getting out of the way.

*Third or extreme method.*—Prepare the feet as explained for the first method. The front shoe (Pl. XIX, fig. 2) should be light in weight, fitted short at the heels, and with short-heel calks inclined well to the front; toe of the shoe thoroughly rolled. The hind shoe (Pl. XIX, fig. 1) should be heavy in weight, with a small toe calk set well back from the front edge of the shoe; toe of the shoe squared; heels long and side clips between the first and second nail holes.

The calks on the front shoe raise the heels, thus diminishing the distance which they must be lifted by the flexor tendons, and consequently cause more rapid breaking over. The toe calk on the hind shoe raises the toe, thus increasing the distance the heels must be lifted by the flexor tendons, and consequently delays the breaking over of the foot. The long heels also increase the labor of the tendons by their extra weight. By using this method the feet are thrown so far out of their natural position that the ligaments and tendons are apt to be seriously affected in time by the heavy strain placed upon them.

### STUMBLING.

**68.** The horse stumbles in breaking over, or just after breaking over, as a result of not raising and carrying a foot high enough to clear the ground. Horses stumble more frequently with the front than with the hind feet.

**Causes.**—Poor conformation; horses with light fore quarters and heavy hind quarters. Weakness: During convalescence from severe sickness or as the result of a strain of a leg muscle. Fatigue: Induced

by long marches or by drawing or carrying heavy loads. Improper preparation: Toe left too long. Improper shoeing: Shoes too heavy or fitted too full at the toe. Laziness, particularly when going down hill, rough ground, and poor horsemanship.

**Remedies.**—The bearing surface of the foot must be leveled, the toe shortened, the shoe made light in weight and thoroughly rolled at the toe, and the thickness of the heels of the shoe slightly increased. This shoe induces more rapid breaking over. The full roller-motion shoe (Pl. XIX, fig. 3) is frequently of value in the prevention of stumbling, because it not only causes a rapid breaking over of the feet but produces higher action.

In cases of stumbling where calks are necessary to prevent slipping, use heel calks and short quarter calks welded on web of shoe between first and second nail holes.

INTERFERING.

**69.** A horse interferes (strikes) when he is in motion by striking any part of a limb with the opposite corresponding foot. Since this fault leaves evidence by rubbing off the hair and even breaking the skin, it is an easy matter to determine whether one or both feet need correction.

**Causes.**—Poor conformation; fatigue; faulty or neglected shoeing.

Horses with good conformation and straight, upright limbs will not interfere if properly shod. Those that toe out generally strike, because the clearance space between the limbs is reduced, while those that toe in usually travel wide. Straight-limbed horses with narrow chests also have a tendency to interfere. In order to correct interfering, the shoer should study carefully the shoeing, the conformation, and the gait of the horse. The first step is to determine the exact part of the hoof that strikes. This may be readily learned by chalking the inside of the wall and trotting the animal slowly. The chalk will be rubbed off from the exact point of contact with the opposite leg.

Inspect the shoeing for projecting clinches or ragged edges of the hoof, due to neglect. If the shoeing is of recent date, note if the shoe is too full. Then inspect the foot and see if the inside is too low or the outside is too high (broken in). This fault bends the leg inward at the fetlock joint, starts the foot on a curve instead of a straight path, and thus lessens the clearance space between the legs.

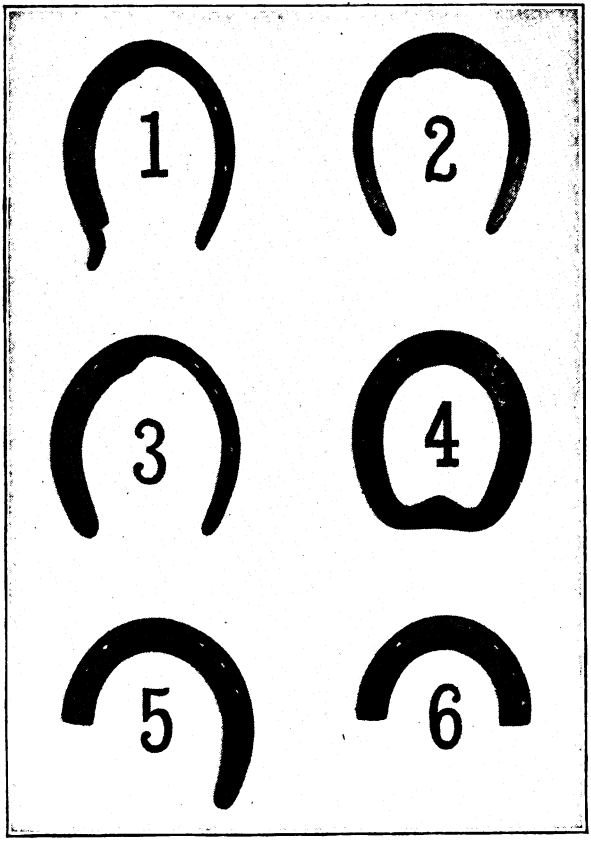



PLATE XX.—WEIGHTED SHOES.

1. Side weight (outside hind). 2. Toe weight.
3. Side weight (inside front).

PATHOLOGICAL SHOES.

4. Bar shoe. 5. Three-quarter. 6. Tip.

PLATE XXI.—EXTENSION TOE.

**Remedies.**—If the fault is in the shoeing or in the preparation of the foot, the remedy in either case is apparent. If the horse continues to interfere after the bearing surface has been leveled and the foot properly shod, different careful experiments must be made, because tests show that there is no fixed rule. A shoe that will be of benefit in one case may be just the reverse in another.

In general, prepare and shoe the foot in such a way that the breaking over will be at the center of the toe. As much, if not more, is accomplished by skillful preparation of the feet than by the use of extraordinary shoes.

If the foot breaks over on the inside of the toe an angular extension (about ⅛ inch; see Pl. XXI) on the inside toe will be beneficial. When the shoe is in place, the part projecting beyond the wall should not exceed that outside the white line on shoe in plate. The extension is made by thinning and widening the web of the shoe at the desired point. Fit the shoe close on outside from center of toe to quarter, and roll outside toe with the rasp, full on the inside from toe to second nail hole, and close from there back, sharp edges on the inside being hot rasped to avoid cutting.

Ordinarily the lightest part of the foot, especially of the front foot, is lifted first. For this reason a side weight (Pl. XX, fig. 3) on the inside of the fore foot will often aid in correcting interfering. As previously stated, this will not always produce the desired result. On account of differences in pastern action, the result may even be obtained by just the opposite—the weight on the outside.

The foot may be prepared with the inside high (broken out) in order to cause the foot to break over the outside the toe and to increase the clearance space.

A small side calk may be placed on the inside of the inner half of the shoe immediately under the part of the hoof that strikes. The calk should conform to the curve of the shoe. (Pl. XIX, fig. 4.) The heel of the shoe should be thickened to correspond to the height of the calk.

*It must be understood* that improper preparation of the foot and the use of a side calk are extreme measures. They throw the foot into an unnatural and strained position, and therefore should not be used unless this discomfort is to be preferred to severe cutting of the legs. As the fault of interfering disappears a return to normal conditions must be accomplished.

If the hind feet strike, the bearing surfaces should be leveled or corrected as in the case of the front feet. A side weight on the outside of the shoe (Pl. XX, fig. 1) swings the foot outward sufficiently to correct the defect in ordinary cases.

### THE MAKING OF SPECIAL SHOES FOR GAITS.

**70. The roller-motion shoe.**—The full roller-motion shoe can be made from heavy bar steel only, and as this is usually not obtainable at Army posts the shoe is seldom used. It is made in the same manner as the plate shoe and the ground surface is then rounded with the hammer from the last nail hole on one side to the last nail hole on the other; the outside edge is made very thin and the inside edge is left unchanged. The shoe is then finished with the rasp.

The service shoe, on account of the crease, can be rounded only at the toe. The rounded toe, however, will generally be found to accomplish the result desired.

**71. The front forging shoe.**—The heel calks of this shoe are turned as explained for the calked shoe (par. 54) and then bent well forward. Hold the shoe on the face of the anvil, the tongs grasping it at the toe, the ground surface up. Strike directly on the calk, bringing the hammer toward the toe. After bending the calk forward, be careful to level its ground surface so that it will rest evenly when the shoe is placed on a flat surface.

The toe is rolled as explained for the roller-motion shoe. (Par. 70.)

**72. The hind forging shoe.**—This shoe is fitted in the same manner as the normal shoe, with the following exceptions: The toe is squared and the heels are cut off so as to be longer than in the normal shoe; the toe clip is omitted and two side clips are drawn.

**73. The toe-weight shoe.**—This shoe is made from the issue front shoe. Heat the shoe to a white heat and with the hammer and a cold chisel cut a line on each half of the ground surface of the shoe halfway between the crease and the inside edge. Each line extends from the heel to a point between the first and second nail holes, thence is carried obliquely to the inside edge. Begin the work of cutting, however, near the toe; never at the heels. The cut should begin obliquely because a right-angled cut weakens the shoe at this place and causes it to break after much wear.

Reheat and cut until the part inside of the lines is entirely removed. The rough edges are finished with the rasp, and the shoe is fitted in the same manner as a normal shoe.

The cold chisel is tempered as explained for the hardy. (*See* Tools.)

**74. The side-weight shoe.**—This shoe is made from the issue front shoe. The process is the same as in the toe-weight shoe, except that the weight is removed from one-half only and that the cut begins at the center of the toe.

In the front shoe the heels are of normal length and finished as in the service shoe.

The weight may be on the inside or outside of a front shoe. No fixed rule can be laid down as to which should be used; the conformation of the horse will decide.

The weight in the hind shoe, however, is always placed on the outside, and extends back toward the buttress as far as possible without covering the frog. The outside heel is drawn about three-quarters of an inch longer than the inside heel, and *from the end of the buttress* is turned outward.

This extension is called a trailer and serves to increase the rotary motion given by the weight.

**75.** The making of a three-quarter shoe needs no special description. It is simply a plate or service shoe with one heel cut off at any desired point by the use of the hardy.

## CHAPTER VII.

## DISEASES OF THE FOOT—CAUSES, SYMPTOMS, TREATMENT—PATHOLOGICAL SHOEING—THE MAKING OF PATHOLOGICAL SHOES.

**76.** Information in this chapter is for the guidance of the Army horseshoer in his capacity as an assistant to his veterinarian. No treatment herein prescribed should be attempted except when directed by the veterinarian or organization commander.

**77.** *Pathological* shoeing is shoeing for the relief of diseased feet. The bar shoe (Pl. XX, fig. 4) is most commonly used because it produces frog pressure, which increases blood circulation and thus assists nature's method of building up diseased tissue. *Removing pressure* means trimming the bearing surface of the foot in such a way that the shoe can not cause pressure upon diseased parts. (Pl. XXII.)

### THRUSH.

**78.** *Thrush* is a diseased condition of the frog, characterized by an offensive discharge and a maceration, or softening, of the horn.

**Causes.**—Filth and moisture, particularly when animals stand in stables saturated with urine. It is both a cause and a result of contracted feet: A cause, by reducing the size of the frog and lessening frog pressure; a result, because the small frog of a badly contracted foot is poor in quality and has a lessened resistance to disease.

**Symptoms.**—At first there is simply an increase of moisture in the cleft of the frog, accompanied by an offensive odor. As the maceration proceeds the discharge and odor become more marked, the cleft deepens, the horn spreads, becomes underrun and loosened, and the sensitive structures are exposed. Lameness is usually absent but it may be severe in very badly contracted feet and in mild cases when the animal is traveling over loose stones.

**Treatment.**—Dry clean stalls are essential. Pare away all loose underrun portions of horn, then dry-clean the frog thoroughly with oakum and paint with strong tincture of iodine; when the iodine dries cover the frog with a pine tar dressing. The astringent powders, such as burnt alum, three sulphates (equal parts of sul-

phate of copper, iron, and zinc), calomel, etc., can also be used. In badly contracted feet shoeing with bar shoes, leather pads and tar and oakum is advisable, to restore the frog to a healthy condition.

CANKER.

**79.** *Canker* is a chronic disease of the corium of the frog and sole, characterized by enlargement and a spongy, vascular condition.

**Causes.**—Filth and moisture, commonly resulting from neglected thrush; injuries which expose the soft structures and do not receive proper treatment and protection.

**Symptoms.**—The diseased area is covered with a foul, moist, cheesy material, and the villi are greatly enlarged and softer than normal. The moisture causes a softening and loosening of the normal horn at the edges of the diseased area, which thus becomes larger, until the entire frog, bars, sole, and even the wall may become diseased and have a general spongy appearance and bleed readily. Lameness is usually absent.

**Treatment.**—First pare the foot down thoroughly, removing all underrun horn, and give it a good cleaning with a strong creolin solution. The soft, spongy material must then be entirely removed with the knife or scissors. Bleeding is usually profuse. A pressure dressing of cotton and oakum can be applied to check the hemorrhage, and left in place for a couple of hours. It should then be removed and the foot wiped dry with cotton and covered with pine tar, which keeps moisture away and is an antiseptic, protective dressing; over this a large mass of oakum should be applied and held firmly in place by a foot bandage. Place the horse in a well bedded stall, which is to be kept dry and clean. The treatment should be repeated at intervals of four or five days, keeping the foot thoroughly trimmed and applying large masses of oakum to produce much pressure over the diseased area. As the parts become normal the soft, cheesy material becomes gradually firmer and more flaky, and the new horn fills in from the edges or from small centers until the entire area becomes covered with a healthy horny layer. The following solution may be used:

| | |
|---|---|
| Formalin | 1 part. |
| 50 per cent alcohol | 9 parts. |
| Bichloride of mercury | 2 drams. |
| 50 per cent alcohol | 5 ounces. |

Apply lightly, and when dry apply dressing.

In mild cases the animal may be shod and kept at work, using a bar shoe and heavy leather pad and packing the foot tightly with tar and oakum. Mild cases readily yield to treatment, but severe cases of long standing require a long time to effect a cure.

BRUISES OF THE SOLE—CORNS.

**80.** These are quite common and usually show reddish areas. A *corn* is a bruise in the angle formed by the wall and bar.

**Causes.**—Stepping on stones and other hard objects; pressure of shoe on sole, due to lowering the wall too much; shoes too short or left on too long, in which case the wall overgrows the heels of the shoe; heels lowered too much; rapid work on hard roads, especially when the feet are hard and dry, causing a great amount of concussion and subjecting the foot to injury. In the unshod foot the bar may curl inward and press upon the sole.

**Symptoms.**—Lameness may or may not be present. The horn is discolored, and where bruises and inflammation are severe great lameness is shown and suppuration may occur. When pus is present it burrows into the surrounding soft structures, causing a separation of the horn and making its exit at the heel or around the coronet. This usually greatly relieves the pain and lameness.

**Treatment.**—Locate the seat of injury and its probable cause by removing the shoe, cleaning the foot and thoroughly testing it with the hoof tester or pincers. Level the foot if uneven, and, if no lameness is present, reshoe, first removing the pressure over the diseased area by trimming or lowering the horn; protect and soften the horn by the use of a leather pad, tar and oakum. If lameness is present, reduce the inflammation by soaking the foot in cold water or by poulticing it. This treatment usually gives prompt relief. If the lameness increases, pus is probably forming and the underrun horn must be removed, exposing the sensitive structures and providing for perfect drainage. Antiseptic washings and dressings should now be used, the diseased parts being kept clean and protected. A good treatment is carried out as follows: First soak the foot in a tub or pail of creolin solution for a quarter to half an hour, then apply cotton saturated with tincture of iodine and cover with a foot bandage. Repeat dressing twice daily. When pus formation ceases and lameness is no longer present, shoe with a bar shoe, after removing all pressure, and apply a leather pad, tar and oakum.

INJURIES OF CORONET AND HEELS (TREADS).

**81.** These are caused by the animal overreaching—that is, striking the heel of the front foot by the toe of the hind foot. Cavalry horses and lead and swing artillery horses are likely to be stepped upon by the animals following when the column is brought to a sudden stop. They are also caused by the animal resting the heel of one foot on the coronet of another, by stepping upon and thus bruising or wounding the coronet, and by contact with hard or sharp objects.

**Symptoms**—Lameness is usually present. The skin is lacerated at the heel or coronet and the parts are sensitive. There is frequently a separation of the hard and soft structures. These wounds, especially those at the quarter and toe, are usually severe and badly infected, and hence dangerous because they are so close to the important underlying structures (joints, tendons, etc.). They require close attention.

**Treatment**—Remove all loosened portions of horn and dress as a wound. Repeat twice daily and protect by foot bandage.

PUNCTURES OF THE FROG AND SOLE—PRICKS IN SHOEING.

**82. Causes**—Punctures of the frog and sole are caused by the animal stepping on nails, glass, sharp sticks, etc. Pricks in shoeing are of two kinds:

(*a*) From the nails being driven into the soft structures, causing immediate lameness.

(*b*) From the nails being driven too close, causing a bulging of the inner layer of horn and pressure on the soft structures. Lameness may be in evidence at once, but usually develops slowly and may not appear for several days.

**Symptoms.**—Lameness, more or less severe. If the animal has been recently shod always suspect the nails. Clean the foot thoroughly and remove the nails one at a time, examining each nail for moisture. Test each hole with the hoof tester or pincers; when the sore spot is pressed the horse will flinch. If the nails are all right examine the rest of foot thoroughly in the same manner.

**Treatment.**—Whether an old or recent wound, trim the horn from about it to establish drainage, clean the wound thoroughly with a strong antiseptic solution and apply an antiseptic dressing. This may be applied as a wet pack, that is, cotton saturated with the antiseptic or a poultice made with a strong antiseptic solution. If the pus burrows under the wall and escapes at the coronet, the

underrun portion of the wall must be removed to allow perfect drainage. Repeat drainage twice daily until pus formation and lameness cease, when the horse can be shod and put to work, protecting the foot with tar and oakum and a leather pad. In all punctured wounds of the foot there is danger from infection with the germs of tetanus, or lockjaw, which is usually present in the soil.

### QUITTOR.

**83.** A *quittor* is a diseased condition of the lateral cartilage or other deep-seated structures of the foot, with the formation of sinuses (tubes).

**Causes.**—Suppurating corns, punctures of the sole, frog, or coronet, in which the cartilage or other tissues are injured primarily, or secondarily by the burrowing of pus.

**Symptoms.**—Swelling of the coronet, with one or more openings (sinuses), which communicate with the diseased area and discharge pus. Marked lameness is usally present. Lameness and pus formation are increased by exercise.

**Treatment.**—Provide for perfect drainage by removing all underrun horn, trimming away dead tissues, etc.; treat with antiseptic foot baths and apply wet antiseptic dressings. The sinuses may be injected with strong tincture of iodine and a wet pack of one one-thousandth solution of bichloride of mercury (one tablet to a quart of water) be applied. Repeat dressing twice daily. Perfect rest is essential. If this does not effect a cure an operation will be necessary.

### QUARTER AND TOE CRACKS (SAND CRACKS).

**84.** A *quarter crack* is a split in the horn of the wall at the quarter; a *toe crack* is a split at the toe. Cracks which affect only the upper border of the hoof are called *coronary cracks;* those affecting the lower border of the hoof are called *low cracks*, while those extending from one border to the other are called *complete cracks*. Horses that have weak quarters are predisposed to it, also those with brittle horn.

**Causes.**—Excessive dryness of the hoof, causing brittleness; lack of frog pressure; contraction; long toes; heavy shoes; large nails and nails set too far back. Those cracks which start at the bottom, usually due to shoeing, are of little importance. Those which start at the coronet are usually troublesome, especially when conformation and feet are faulty.

**Symptoms.**—A fissure in the wall at toe or quarter. The fissure may be shallow and not cause lameness, or it may be a deep one which extends through the thickness of the wall and, owing to pinching of the sensitive laminæ, causes lameness, frequently with extensive laceration and hemorrhage.

**Treatment.**—First remove the shoe and soften the horn and reduce the inflammation by cold foot baths or poultices. Then cut away the hard overlapping edges of the horn to prevent the pinching of the laminæ. Shorten the toe, lower the wall, and trim away the bearing surface of the wall so that it does not rest on the shoe for half an inch to an inch on each side of the crack (Pl. XXII). Apply a bar shoe, providing considerable frog pressure, and keep the foot soft and elastic by applying tar, oakum and a leather pad. Keep the wall surface soft, especially over the crack, by daily applications of pine tar or an oil. Blisters to the coronet are beneficial by stimulating the growth of horn. A run at grass, barefooted, for two or three months is decidedly beneficial.

In case of toe crack the operation is the same. In shoeing, the wall is cut away at the toe to prevent pressure. A bar shoe, rolled at the toe and with a clip on each side of the crack, is recommended. The bar shoe serves two purposes:

1. Ordinarily it is not possible to drive the proper number of nails on the side of the affected quarter, but the bar keeps the shoe in place on account of the firm nailing on the other side.

2. The bar gives frog pressure and expansion, which are desirable because quarter cracks usually result from a weak and drawn-in quarter.

### FALSE QUARTER.

**85.** This term is given to a faulty condition of the hoof in which the horn is thin and weak, and extends from the coronet to the ground surface of the wall.

**Causes.**—Most commonly caused by barbed wire cutting into and destroying the horn secreting layer of the coronary band.

**Symptoms.**—The horn of the affected part is usually concave, rough and scaly in appearance, and is much thinner than the adjacent healthy parts of the wall. Owing to the weakened condition of the wall, cracks may appear when the horn becomes hard and dry and cause lameness.

**Treatment.**—This is confined to protection of the weakened area by the use of the bar shoe, removal of pressure, and keeping the

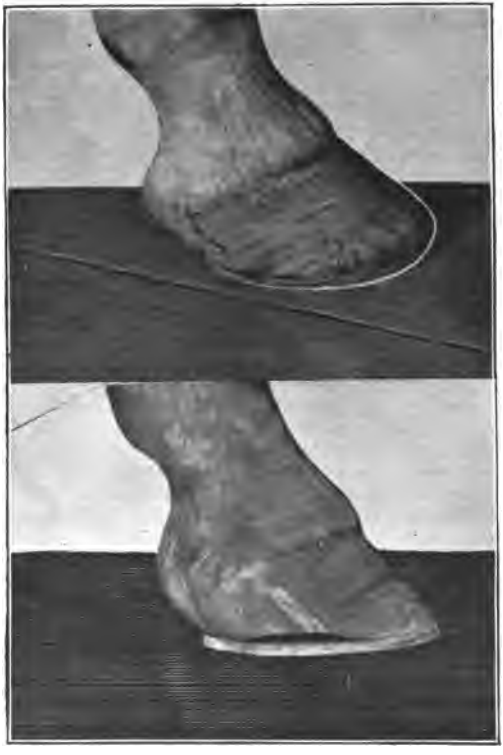


PLATE XXII.—QUARTER CRACK.

Before and after treatment and shoeing.

foot soft and elastic, preferably by the use of tar, oakum, and leather pad. Should a crack appear and lameness result, treat as directed under quarter crack.

LAMINITIS.

**86.** *Laminitis*, or *founder*, is an inflammation of the sensitive laminar corium, usually of the front feet, and may involve the adjoining structures. The pain is very acute, because the swollen laminæ lie between two hard surfaces (the coffin bone and the wall) and are pinched by them. There are three forms: *Acute*, with pronounced symptoms; *subacute*, in which the symptoms are mild, and *chronic*, resulting from the acute, with structural change of the feet and chronic lameness.

**Causes.**—These are many and varied. Concussion, chilling of the body from standing in a breeze while overheated, drinking large amounts of cold water after severe exertion and while in an exhausted or overheated condition, grains eaten to excess, and improper foodstuffs such as musty hay and grain, wheat and new oats, green foods such as alfalfa, clover and corn eaten to excess.

**Symptoms.**—In the acute form all four feet may be affected, but the disease is usually limited to the front feet. The animal stands in a fixed position with the front legs advanced, the weight being carried on the heels; the pain is greatest at the toe because the laminæ are largest and most vascular at that place; the hind legs are advanced under the body to relieve the forefeet of weight. Occasionally the animal sways backward, elevating the toes to further relieve them of weight and reduce the pain. He is moved with difficulty because the movement increases the pressure and pain in the feet which remain on the ground. The feet are hot, and the arteries of the cannon and pastern have a distinct throb. The animal groans with pain and sweats profusely. The pulse is full, strong and rapid, beating 60 to 80 per minute. Constipation or diarrhea may be present. Temperature 102° to 106°. In some cases the animal stands persistently; in others he may lie for hours at a time.

**Treatment.**—*Subacute laminitis.* This form may be conveniently treated in the field by standing the animal in a pool of water, preferably in a running stream, and removing the shoes if the command is stationary; in garrison by removing the shoes and standing the animal in a soaking stall, wet clay, or water hole. Feed laxative diet and give potassium nitrate.

*Acute laminitis.*—Place the animal in a well bedded box stall; if in the field, in a soft, grassy, shady spot if possible. If he does not lie down throw him. This affords great relief by resting the feet and reduces the pain and inflammation. After once experiencing the great relief afforded by lying, the animal will then usually lie of his own accord. Remove the shoes. Give a laxative of 1 or 2 pints raw linseed oil, and give potassium nitrate in 1 to 2 ounce doses three times a day. Apply cold wet packs to the feet and legs as high as the knees and keep them wet. Feed laxative diet. As soon as the pain has diminished moderate exercise is beneficial. This may be gradually increased as the animal improves. If recovery is not marked after five or six days apply a bar shoe with a wide web, well rolled at the toe and concaved, and then a blister of cantharides around the coronet; repeat the blister if necessary. Use no toe clips.

*Chronic laminitis* is permanent laminitis resulting from one or more attacks of the acute form of the disease. In the chronic form there is always inflammation, sometimes more, sometimes less, but never as severe as in the acute form. Laminitis frequently produces great structural changes in the feet, due to loosening of the union between the horny and sensitive laminæ, and a rotation backward of the pedal bone due to increased tension on the flexor tendon. These changes consist of dropped sole, increased height of the foot at the quarters and heels, seedy toe, and a chronic type of inflammation as noted above. When such changes result the usefulness of the animal is greatly lessened, but by careful shoeing he is able to do slow work satisfactorily.

In a case of chronic laminitis, pay special care to the concaving and use a bar shoe rolled both at the toe and at the heel; this is a modified form of the *rocker-motion* shoe. This shoe produces a uniformly smooth breaking over, without much jar.

### SEEDY TOE.

**87.** *Seedy toe* is a mealy condition of the horn of the wall, most commonly in the region of the toe.

**Causes.**—Most commonly the result of generalized laminitis with structural changes in the feet; localized laminitis caused by nail pricks in shoeing and stepping on sharp objects; injuries to the wall from blows; pressure from heavy, deep-seated clips; deep hoof branding with irons insufficiently heated; excessive moisture, causing disintegration (crumbling) of the horn fibers.

**Symptoms.**—A soft, flaky condition of the horn, lameness usually being absent. If there is marked crumbling of the horn with the formation of a cavity between the horny and sensitive laminæ, lameness may result from injury to the sensitive structures by dirt, and infection and pus formation may occur.

**Treatment.**—Remove the unsound horn, clean the cavity, protect the foot by means of a leather pad and apply a dressing of tar and oakum. Use a bar shoe, well rolled at the toe; no nails should be driven in the diseased part, but, instead, side clips should be used, care being exercised that they bear only on the healthy horn. Stimulate the growth of horn by applying a blister of cantharides or mercury to the coronet.

### NAVICULAR DISEASE.

**88.** *Navicular disease* is a chronic inflammation at the point where the tendon of the deep digital flexor passes over the navicular bone.

**Causes.**—Faulty conformation, in which the limb is placed under the body and carries excessive weight; faulty conformation of the feet in which the heels are high and narrow, resulting in excessive concussion; long toes, in which the strain on the deep flexor tendon is increased; standing on inclined surfaces, such as stalls and picket lines with an upward slope, thus increasing the strain. It invariably affects the front feet because the weight upon them is greater than on the hind feet.

**Symptoms.**—Lameness, which is slight at first, but gradually increases in severity. While traveling, the affected leg takes a shorter step and the toe strikes the ground before the heel comes down. In some cases the lameness may disappear for a day or two. When resting, the animal points the toe, and if lame in both feet the limbs are advanced and the feet rested alternately. If kept in a stall with a soft floor a hole is usually dug and the animal stands with the toes in the hole, the heels resting on the edge. This greatly relieves the strain on the diseased area. As a result of the constant standing on the toes the frogs atrophy (waste away) and the heels contract and the wall at the heels becomes higher than normal. Pressure over the navicular area with the hoof tester or pincers causes marked pain. *Bar shoes also greatly increase the lameness.*

**Treatment.**—The disease is incurable, and treatment merely serves to diminish the effects, though in the first stages treatment may be beneficial. The inflammation should be reduced by means of cold foot baths and poultices, followed by the application of

blisters around the coronet, after which the animal should be turned out on soft ground for several months. When necessary to use the animal the toes should be well shortened and shoes with thickened heels or heel calks applied. Keep the feet soft by the use of foot baths, poultices, or the application of a leather pad, tar, and oakum.

### SIDEBONES.

**89.** *Sidebone* is an ossification (turning into bone) of the lateral cartilage, frequently resulting from improper leveling of the foot. Horses with flat feet and weak quarters are predisposed to this disease.

**Causes.**—This disease is common in heavy animals working on hard pavements and is due to concussion; improper preparation of the foot in shoeing, one side (usually the outside) being left higher than the other, thus increasing the concussion on the lateral cartilage on the high side; injuries to the region of the quarter and heels by treads, wire cuts, etc.

**Symptoms.**—A hard unyielding condition of the lateral cartilage, with or without lameness. The affected side of the foot contracts, as a result of lack of expansion. Lameness is increased by fast travel on hard roads and by a hard, dry condition of the hoof.

**Treatment.**—If lameness is present, first remove the shoe and level the foot, then reduce the inflamation by cold foot baths and poultices, followed by the application of a blister and a rest of four to six weeks. If lameness persists repeat the blister and rest. In shoeing an animal afflicted with sidebones level the foot carefully. If the foot is affected on one side only and contraction has resulted, the web of the shoe should be widened sufficiently to extend out to where the normal foot would be. A plain shoe with rolled toe is recommended. *Frog pressure produces soreness and must be carefully avoided.*

### CONTRACTED FEET.

**90.** *Contracted feet* refers to an unnatural shrinking or narrowing of the feet at the quarters and heels. It is most frequently seen in the front feet. The feet of some horses are naturally narrow, resembling in shape the feet of a mule.

**Causes.**—Lack of frog pressure is always the primary cause; contributory causes are, lack of exercise and lack of moisture, thrush, the continued use of heel calks, concaving the bearing surface of the shoe back to the heels, and opening the heels with the knife.

**Symptoms.**—The foot, instead of being wide at the quarters and circular in shape, becomes narrow at the heels, which in very bad cases may overlap, the frog atrophies and is frequently affected with thrush. Lameness may be present as a result of the pinching of the sensitive structures by the walls of the hoof.

**Treatment.**—Frog pressure is essential. If the feet are extremely dry and hard they may be softened by standing the animal in moist clay or in water. If the animal is to be used on soft ground let him go barefoot, or shoe with the tip (Pl. XX, fig. 6); otherwise use the bar shoe with leather pad, tar, and oakum, packing the oakum very tight under the frog.

### DRY FEET.

**91.** This is a troublesome condition, occurring most frequently in dry weather.

**Causes.**—The moisture of the foot normally comes from the blood, and depends largely upon the circulation, and a certain amount of it comes by absorption from the ground. Shoeing, by raising the frog from the ground, lessens the circulation and interferes with absorption of moisture from the ground. Sudden changes in weather, alternation from wet to dry, and soaking the feet in water cause a maceration of the perioplic covering and facilitate the evaporation of moisture from the wall. Working in sandy ground wears away the periople and facilitates evaporation, and rasping the periople produces the same condition.

**Symptoms.**—A hard, dry, and inelastic condition of the horn. This increases concussion and frequently causes inflammation of the foot corium and produces lameness.

**Treatment.**—Soften the feet by poultices or by foot baths and then apply an oily covering to the wall surface; or pack the cavity between the branches of the shoe with wet clay two or three times a week. This is preferable to soaking in water as it supplies moisture to the foot and does not macerate the periople. Work the animal on soft ground as much as possible.

An excellent dressing for dry, brittle, or contracted feet is made of the following:

| | |
|---|---|
| Creolin | 4 ounces. |
| Pine tar | 4 ounces. |
| Raw linseed oil | 24 ounces. |

Mix and apply to both wall and sole twice a week. When the animal is shod the foot should be prepared and then a coating of the dressing applied to the sole *before* nailing on the shoe. At other times the dressing should be applied at *evening stables*.

Or

| | |
|---|---|
| Pine tar | 4 ounces. |
| Cosmoline | 4 ounces. |
| Neat's-foot oil | 24 ounces. |

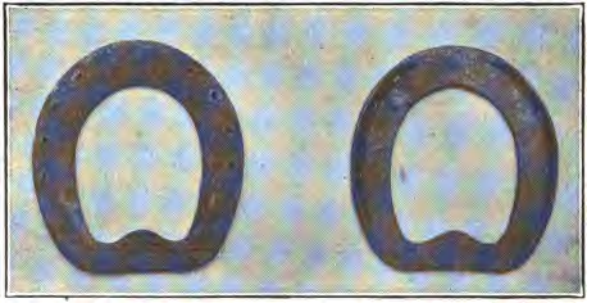
Melt together over a slow fire. Apply the same as the preceding dressing.

A blister of cantharides around the coronet is beneficial by stimulating the growth of horn fibers.

**92.** In this chapter have been treated the common foot ailments of the Army horse. Pathological shoeing for drop sole resulting from laminitis, for bowed tendons, and for other troubles that can not be permanently cured has been omitted from this textbook. The Army horse must be ready for hard service. When his feet are incurably bad he should not be nursed, but should be placed on the inspection report.

### THE MAKING OF PATHOLOGICAL SHOES—THE BAR SHOE.

**93.** This shoe, as previously stated, is more frequently required in Army shoeing than any other special shoe. It is made from the



issue shoe, and the general fit and shape when finished are the same with the exception of the bar across the frog.

Select an issue shoe that is a size larger than the one that would ordinarily be used, and preferably a front shoe—a size larger in order that the heels shall be long enough to admit of turning the bar and a front shoe on account of its width and stock.

It is advisable for the beginner to fit the shoe to the outline of the foot before turning the heels for preparing the bar, as the shoe is more easily fitted before welding the bar and the shoer can estimate the amount of stock required for making the bar.

**94.** To prepare the heels of the shoe before turning in the bar—

(*a*) **Scarfing.**—This is accomplished by holding the shoe on the face of the anvil (either surface on the face) and striking on the upper edge of the extremity of the heel, the hammer held at an angle of about 45° with the plane of the upper surface. This will result in a bevel between the upper and lower surfaces of the heel about a half inch in length. Scarf the other heel in the same way, except that the scarf is made on the opposite surface.

(*b*) **Pointing the scarf.**—To insure a smooth weld. This is done by holding each heel in turn so that it will rest at an angle upon the face of the anvil near the heel, and striking on the upper edge at the end. This is the same position and accomplishes the same result as pointing the heels of the plate and service shoes after drawing (par. 13).

This cut shows the smith working on the heel of the shoe farthest from his hammer hand, which was done simply to aid the photographer in producing a photograph that would show the angle of the

scarf, most distinctly, while at the same time give a good view of the position of the tongs and the hand holding same.

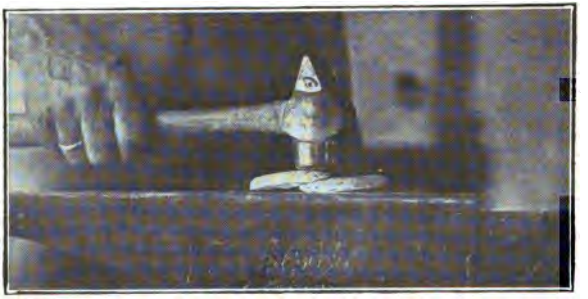
**95. To turn in the bar.**—Hold the shoe with the tongs at or above the toe; place the inside edge of the heel to be turned, on

the point of the horn, the quarter nearly horizontal, with 1 inch or an inch and a half projecting over the horn, depending upon the length of the bar required.

Strike on the upper edge of the portion projecting over the horn, lowering the hand as the bend progresses, and turn in the desired length at a right angle.

The length of the bend should be a little more than one-half the length of the finished bar, as the ends must overlap for welding. Turn the other heel in the same manner.

**96. To prepare the bar for welding.**—Close the shoe bodily until the scarfed points overlap and then hammer the points down until they fit closely, leaving no space for coal dust to accumulate.



**97. To weld the bar.**—Place the bar in the fire and heat to a welding heat (*see* Heats), tilting or rocking the shoe forward and back to insure an equal heat on both sides. When the proper heat has been obtained (fluxing), place the bar on the face of the anvil

and strike a few light blows on one point, then reverse the shoe and strike on the opposite point. This will bind the points together.

Reheat the bar to the welding heat and, taking the same position, complete the weld by heavier blows, reversing the shoe so that both sides will be flattened. After the weld is completed the bar is shaped by holding one corner on the point of the anvil and striking on the center of the bar and then reversing. This will set the center of the bar forward, give it the correct shape at the heels, and prepare it for beveling. The front half of the upper surface of the bar must be hammered down (beveled) to the point, thus forming a cradle for the frog.

**98. Fitting.**—The bar shoe is fitted as is the service shoe, and the same heats are used. A little more allowance, however, is made for expansion on account of the added frog pressure.

**99. To open the toe.**—The shoe is heated throughout to an even heat and held upright with the bar on the face of the anvil. The

blows are struck along the toe, thus opening the toe and quarters without changing the bar.

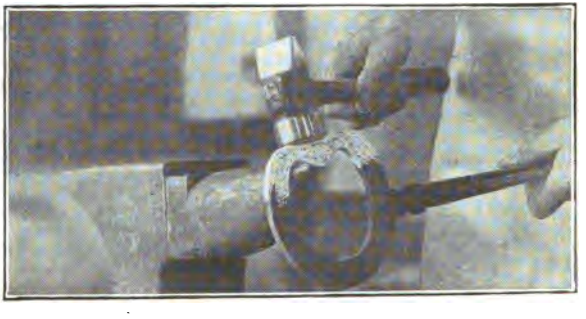
The toe may be opened as in the service shoe.

**100. To widen the heels.**—By lengthening the bar.

(*a*) **When the quarters are too long.**—Heat the bar and the heels to a cherry heat. Hold the shoe in the tongs at the toe and place inside edge of the heel on the point of the horn, resting at the point from which it is desired to turn the heel into the bar.

Strike on the end of the heel projecting over the horn. Then reverse the shoe and proceed in the same manner with the other heel.

(*b*) **When quarters are of the correct length.**—Heat the bar to a white heat and draw it out by working on the face of the anvil. This will lengthen the bar and at the same time reduce its thickness. After drawing out in this manner, the bar must be leveled



with the upper surface unless the frog is so large that it will produce the desired pressure. The bar may also be drawn on the point of the horn, working on one half and then reversing; this method thickens the bar and should be used if the frog is very small.

**101. To close the heels.**—By shortening the bar.

(*a*) **When the quarters are of the correct length.**—Heat the bar and heels and, holding one heel on the face of the anvil,

shoe perpendicular, strike on the elevated heel. This will shorten the bar, also narrowing and straightening the quarters.

(*b*) **When the quarters are too short.**—Place an inside edge of the triangular part of the bar on the point of the horn and strike on the part projecting over it. This will turn part of the bar into the heel.

(*c*) **When the quarters are too long.**—Hold the shoe upright, the center of the bar on the point of the anvil, and strike on the toe.

This will push the bar toward the toe and shorten the shoe, bringing the heels closer together.

**102. To lengthen the quarters without changing the bar.**—Draw out the heels on the horn of the anvil as in the service shoe.

**103. When one quarter is longer than the other,** to bring the shoe back to its proper shape. Heat the shoe throughout, and, holding it upright with the point of the heel of the longer quarter on the face of the anvil, strike on the upper edge of the shoe directly over the point resting on the anvil.

**104.** Thinning the bar is often necessary in the case of a large frog. To accomplish this, the bar is welded at about one-half the required length and then drawn out on the face of the anvil, its lower surface being leveled with the ground surface of the shoe.

**105.** In the case of an exceptionally large frog, it is necessary to curve the bar below the ground surface to allow sufficient room and to prevent too much pressure. Toe and heel calks must be used with this shoe to insure a level ground surface.

**To curve the bar.**—Hold the shoe so that one end of the bar rests on the edge of the face and the other on the horn of the anvil and strike on the center of the upper surface.

THE TIP.

**106.** The use of the tip for contracted heels leaves the foot in more nearly a state of nature than any other shoe, it is sufficient for ordinary work, and is easily applied. It should be thin, only thick enough to hold the nails, and not be flexible. The best tip can be made from an old shoe uniformly worn, the quarters being cut off just in front of the fourth nail hole. Using the rasp across the toe, lower the toe the desired amount as far back as the tip extends. The heels of the tip should be thinned. If after the tip is secured in place the walls back of the tip extend below its ground surface, they can easily be lowered level with the tip by use of rasp.

The tip may be made from bar steel. In such cases two nails on a side are sufficient, the nail holes being punched to correspond to the first and third nail holes of a service shoe.

## CHAPTER VIII.

## SHOEING REFRACTORY HORSES.

**107.** Most horses that can be classed as refractory in shoeing have been brought to this condition by improper handling when green and unaccustomed to the sights and sounds of a shoeing shop.

When a young horse has been assigned to an organization, a common practice is to send him at once to the shop with instructions that he be shod by quiet means if possible, but by force if necessary.

No greater evil exists in the mounted service. It is as much our duty to gradually train a young horse to submit to shoeing as it is to patiently drill him to surrender to the bit and to work in the saddle or harness.

Summary methods not only ruin the horse's disposition, but subject the shoer to constant danger of injury.

**108. Shoeing young horses.**—The first step should be to teach the young animal that raising his feet will do him no harm, and this lesson should be given at the first grooming. The method of raising the forefoot and the hind foot, as explained in this manual, should be thoroughly understood by all enlisted men and be a part of the instruction of every recruit.

When the young horse surrenders his foot, lower it again quietly and pat him; later use the brush on the soles of his feet; next tap the soles lightly with the currycomb; finally, take the shoer's position and go through the same steps. This complete instruction may be a matter of a day or of many days, depending upon the animal's disposition, but it should not be slighted nor hurried.

In the department of equitation at the Mounted Service School the following method is used with young horses that are disposed to kick when their hind legs are first handled. The horse is equipped with a cavesson, which is held by the animal's trainer. A surcingle is placed around the girth. The man that grooms the horse takes hold of the surcingle with the inside hand, in order to move with the horse and be secure against injury. With the outside hand he

strokes the haunches and legs, gradually working downward. In the meantime the trainer pats the horse on the neck, but corrects him sharply with the cavesson whenever he displays temper. This method is almost invariably successful.

The second step is to let the young horse grow accustomed to the shop. While the horseshoer is at work on a *quiet horse* the young horse should be led into the shop and held by the man who has been grooming him and raising his feet.

The animal *should not be tied*, nor should he be held by any other man than the one he knows and trusts.

When the animal shows neither timidity nor excitement the shoer begins work on the feet. Frequently the removal of the surplus growth of horn is all that can be accomplished without excitement or resistance. At the first sign of either, work for that day should be abandoned and the horse removed from the shop.

The shock of the hammer is conveyed to the joints of the pastern bones, and the green horse, startled thereby, will struggle to free his foot. The shoer can usually handle a forefoot easily unassisted. If a good helper holds the hind leg in a comfortable position on his thigh and holds the hoof firmly with both hands, the shoer can work with more certainty, the shocks of nail driving will be taken up, to a great extent, in the helper's wrists and arms, and the horse will stand quietly.

Patient, quiet work will eventually succeed and thereafter each shoeing is more easily completed.

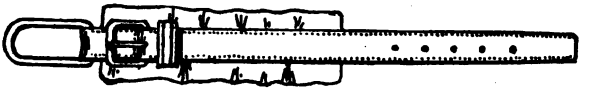
**109.** There are, however, certain highly nervous horses in nearly every organization that are refractory as a result of previous bad handling, and in the emergencies of active service there may be insufficient time to quietly prepare new mounts for shoeing as explained above.

In these cases some form of restraint is required, but in each instance no more force should be employed than is absolutely necessary—*the gentlest method should be tried first.*

The cavesson, as a means of correction, will usually make a horse stand still and is to be preferred to the twitch. The latter, although effective, is a brutal instrument, and should never be used except upon an animal otherwise unmanageable; moreover, after repeated use of the twitch the horse dreads any approach of the hands to his muzzle, and can be bridled only with the greatest difficulty. Severe use of the twitch will also permanently disfigure the animal's appearance.

**110.** If the cavesson is insufficient, the rigging described below should be used.

**The cuff.**—A strap of double thickness of leather, 18 inches long and 1½ inches wide, is sewed to a D ring 3 inches long and made of ⅜-inch round iron. A piece of thin leather 9 inches long and 3 inches wide is sewed on the inside of the strap next to the D ring; a buckle and keeper are sewed on the outside of the strap as shown.



**The surcingle.**—Two 3-inch rings are sewed on the outside of the issue surcingle and are so placed that when the surcingle is adjusted the rings will hang down in the position of the quarterstrap rings of a saddle.

**A rope** ¾ inch in diameter and about 20 feet long; an eye-splice should be made at one end.

This rigging can be easily made in any organization. For use in the field the rope is replaced by a lariat. The cuff and surcingle together weigh only 2 pounds 5 ounces, and can readily be packed in a saddlebag.

TO RAISE A FOREFOOT.

**111.** Strap the cuff around the pastern, the ring above the heels. Pass an end of the rope through the ring and hand both ends over the horse's back to a helper.

The horse's head, as usual, should be held by the man that grooms and trains the animal.

This man should stand on the side of the foot to be raised in order to avoid injury if the horse strikes.

The shoer gently but forcibly flexes the knee and raises the foot, while the helper takes in the slack of the doubled rope. If the horse is fractious, the helper passes both ends through the ring on his side. Grasping the rope close under the surcingle ring with the hand nearest the horse's head, and holding the ends securely against the hip in the other hand, the helper is secure against injury, can move with the horse and control the slack to the best advantage.

PLATE XXIII.—RAISING FRONT FOOT OF REFRACTORY HORSE; ALSO HIND FOOT, FIRST METHOD.

If a helper is not available, the shoer secures one end of the rope to the D ring (by the eye or by a knot), passes the other end through the surcingle ring on his own side and, after raising the foot, ties a half hitch.

TO RAISE A HIND FOOT.

(FIRST METHOD.)

**112.** Strap the cuff around the pastern, the ring above the heels. Draw the horse's tail to one side and make a loop in it; fasten one end of the rope in the loop by a "single sheet bend." Pass the other end through the D ring and draw it to the rear, where it is held by helpers. The horse is tied, but the head is held as usual. When the shoer raises the foot, the helpers draw in the slack of the rope and the foot is supported (by the animal himself) in a good position for work. If he kicks he can do no harm, as his foot must move along the rope. After one or two such efforts he will ordinarily stand quiet.

If helpers are not available, the end of the rope may be secured to a post or tree, but must be fastened in a manner to permit of prompt release in case of a protracted struggle, during which the horse might throw himself and be injured.

Mr. Churchill, instructor in shoeing, used this device for 14 years in civilian practice with unfailing success. (See Plate XVI.)

TO RAISE A HIND FOOT.

(SECOND METHOD.)

**113.** Strap the cuff around the pastern, the ring to the front. Put the surcingle around the neck in front of the shoulders, loosely, so that it will not bind and choke the animal. Make the rope fast in a ring on the surcingle, pass the free end through the ring on the cuff and back through the ring on the surcingle, and draw the foot forward and upward. This is an inconvenient position of the foot for an inexperienced workman, but it prevents the animal from kicking and guards both the animal and the shoer from injury. With a little care the animal can be quickly and properly shod.

If the rigging is not at hand use a 1-inch or 1½-inch rope, preferably the latter size, as smaller rope is apt to burn the animal. Make a loose collar with a short piece of rope, pass a loop of a long rope around the pastern and draw the foot up as described above. If only one

PLATE XXIV.—HORSE IN STOCKS.

piece of rope is available and it is not desired to cut it, tie a bowline loosely around the neck, pass the end of the rope around the pastern and through the bowline, and proceed as above. In using a rope

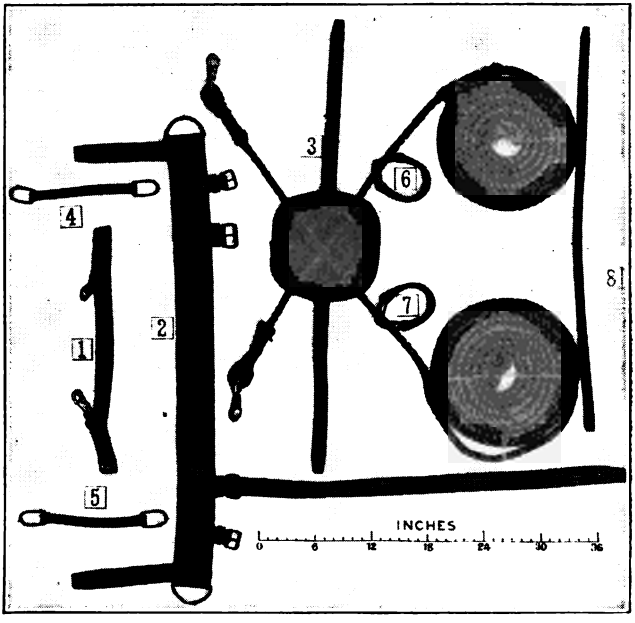



PLATE XXV.—HARNESS FOR THROWING HORSE.

without the cuff the shoer should raise the foot and adjust the rope in the hollow of the pastern while an assistant takes up the slack; if the foot is raised by means of the rope alone, even a large rope running through the hollow of the pastern is apt to burn.

PLATE XXVI.—THROWING THE HORSE FOR SHOEING.

**114.** When it is found that a horse is so vicious that it is dangerous to shoe him unless he is rendered helpless, two courses are open. One is to put him in the stocks; the other is to throw him and tie him down.

The latter method is a *last resort*, to be used only when quieter methods have been tried and proved unsatisfactory.

The harness used in the farriers' branch of this school to throw horses for minor operations has been found to answer the purpose and does not harm the horse. Throwing and "hog tying" a horse without other appliances than a rope should be avoided, as this method usually burns the horse badly and has been known to result in permanent injury.

The throwing harness (Pl. XXV) consists of:

1. Bellyband with snap hooks for front hobbles.
2. Breast strap with suspending neck strap.
3. Saddle pad with crossed ropes, each 20 feet long.

4 and 5. Front hobbles.

6 and 7. Hind hobbles.

8. Check strap, used to connect the saddle pad with halter crown strap.

The harness is shown in detail in the illustration. The scale of inches will enable any good saddler to manufacture it accurately, and Plate XXVI also shows clearly the manner in which it should be adjusted and used.

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